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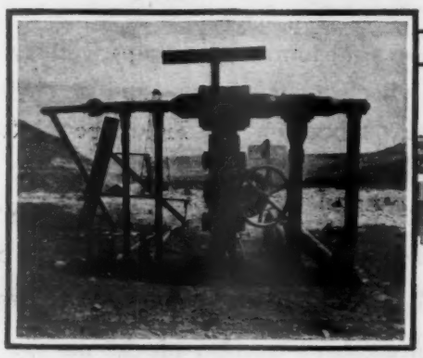

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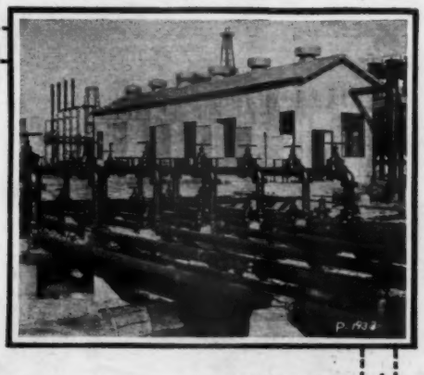

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Advertisers' Index on Page 33

Table of Contents on Page 34

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The ADVERTISERS' INDEX

A

Acme Fishing Tool Co.
Aetna Ball Bearing Mfg. Co. 229
Ajax Iron Works
Ajax Rope Co.
Alfit Packing Co., Inc.
Allegheny Steel Co.
Allis-Chalmers Mfg. Co.
Alloys Company, The
Aluminum Co. of America
American Cable Co., Inc. 128
American Car & Foundry Co.
American Hammered Piston Ring Co....
American Iron & Machine Works, Inc.... 22
American-La France & Foamite Corp...153
American Manganese Steel Co.
American Radiator Co.
American Roller Bearing Co. 123
American Rolling Mill Co.
American Schaeffer & Budenberg Corp..
American Sheet & Tin Plate Co.....176
American Steam Pump Co.
American Telephone & Telegraph Co....
American Well Works
Andrews Steel Co. 159
Arco Company, The
Armstrong Bros. Tool Co. 233
Ash Grove Lime & Portland Cement Co..172
Athey Truss Wheel Co. 21
Atmore, Robert N., Co. 166
Austin Co.
Austin Machinery Corp. 139
Axelson Machine Co. 105

B

B. & A. Specialty Co.
Baash-Ross Tool Co.
Babcock & Wilcox Tube Co., The
Badger, E. B., & Sons, Co.
Baker Casing Shoe Co. 167
Baker-Lockwood Mfg. Co.
Baldwin Chain & Mfg. Co.
Banner Rock Products Co.
Barber-Greene Co. 9
Barco Manufacturing Co. 71
Barnickel, Wm. S., & Co. 232
Barnsdall Refineries, Inc.
Bartlesville Supply Co.
Bartlett Hayward Co., The
Barrett, G. E., & Co. 231
Belchic & Laskey, Inc. 160
Belmont Packing & Rubber Co. 221
Bessemer Gas Engine Co. 133
Bethlehem Steel Co. 84-85
Bignall & Keeler Machine Works....
Billings & Spencer Co., The
Bovaird Supply Co., The
Braden Steel & Winch Co.
Braun, C. F., & Co. 14
Bristol Co. 230
Broderick & Bascom Rope Co.
Brooks Engineering Corp.
Brown, Arthur C. 234
Brown Instrument Co.
Brownell Co.
Buckeye Traction Ditcher Co.
Buda Co.
Buffalo Bolt Co.
Buffalo Gasolene Motor Co.
Burt Mfg. Co.
Butler Mfg. Co.
Byers, A. M., Co.
Byron Jackson Pump Mfg. Co. 56

C

California Pipe Line Machine Co. 228
Cameron Iron Works 165
Cameron Tool & Supply Co., The 130
Campbell, J. A. 126
Canadian Pacific Railway Co.
Carbondale Machine Co. 233
Carey, Phillip Co., The 209
Caterpillar Tractor Co.
Celite Products Co. 156
Central Alloy Steel Corp. 207
Central National Bank & Trust Co., The..224
Central Tube Co. 211
Century Brass Works, Inc. 129
Chain Belt Co.
Champion Machine & Forging Co. 171
Chaplin-Fulton Mfg. Co. 228
Chapman Valve Mfg. Co.
Chestnut & Smith Corp. 18
Chicago Bridge & Iron Works 67
Chicago Pneumatic Tool Co. 140
Chipman Chemical Eng. Co., Inc.....
Chisholm-Moore Mfg. Co.
Clark Bros. Co. ....Back Cover
Classified Wants 184-185
Climax Engineering Co. 163
Columbian Rope Co.
Columbus Forge & Iron Co.
Connor, W. B., Co., Inc., The 234
Continental Supply Co., The 113-115-117
Cooke Seal Ring
Cooper, C. & G., Co. 90-91
Crane Co. ....Front Cover
Crane Packing Co. 229
Crescent Belt Fastener Co.
Crucible Steel Co. of America 103

D

D. & B. Pump & Supply Co. 29
Darling Valve & Mfg. Co. 20
Dart, E. M., Mfg. Co. 232
Davis, G. M., Regulator Co. 148
Day Petroleum Corp., The 183
Dearborn Chemical Co. 221
Delta Electric Co.
DeSoto Fdy. & Mch. Co., Ltd.....
Detex Watchclock Corp.
Detroit Graphite Co.

D

Dixon, Joseph, Crucible Co.
Donovan Boiler Works, Inc. 216
Dresser, S. R., Mfg. Co. 45
Dunn Mfg. Co.

E

Eagle-Picher Lead Co. 3
Eastern Torpedo Co. 232
Economy Pump & Oil Tool Co., The....174
Edward Valve & Mfg. Co.
Electrical & Magneto Co.
Elliott Core Drilling Co.
Empire Oil & Refining Co.
Emsco Derrick & Equipment Co.
Ethyl Gasoline Corp.
Exchange National Bank

F

Fairbanks-Morse & Co.
Federal Supply Co.
Fenwick-Reddaway Mfg. Co. 230
Fisher Governor Co. 55
Fiske Tire Co., Inc., The
Flexible Steel Lacing Co.
Fluor Construction Co. 222
Ford Chain Block Co.
Foster Wheeler Corp. 31
Foxboro Co., Inc., The
Franklin Valveless Engine Co. 106-107
Frick-Reid Supply Co. 2

G

Gardner-Denver Co. 145
Garlock Packing Co. 151
Gasoline Recovery Corp.
Gaso Pump & Burner Mfg. Co.
....Inside Back Cover
General Asbestos & Rubber Co.
General Electric Co. 6
Gilbert & Barker Mfg. Co.
Goodrich, B. F. Rubber Co.
....Inside Front Cover
Goodyear Tire & Rubber Co.
Gott, H. P., Mfg. Co.
Goulds Pumps, Inc.
Graham Brothers
Graver Corp. 93
Gray Processes Corp.
Greenspon's, Joseph, Sons, Iron & Steel Co. 227
Griscom-Russell Co. 58
Guiberson Corp. 72
Gulf Refining Co.

H

Haggard & Marcusson Co. 125
Halliburton, Erle P., Co.
Halliburton Oil Well Cementing Co..... 32
Harbison-Walker Refractories Co. 232
Harrisburg Pipe & Pipe Bending Co.....
Haynes Stellite Co.
Hazard Wire Rope Co. 51
Heat Transfer Products, Inc.
Heppenstall Forge & Knife Co.
Hercules Motors Corp. 25
Hercules Supply Co.
Hercules Tool Co.
Heydrick Mapping Co. 234
Hill, Hubbell & Co. 88
Hills-McCanna Co.
Hinderliter Tool Co.
Homestead Valve Mfg. Co.
Hope Engineering & Supply Co.....100-101
Hopkins, Edwin B. 234
Hough, Charles N., Mfg. Co.
Houston Gulf Gas Co. 215
Hoyt Metal Co.
Hughes Tool Co. 135
Humble Oil & Refining Co. 164
Hunt, Robert W., Co.
Hussmann Hotel 234
Hyatt Roller Bearing Co.

I

Imperial Belting Co. 146
Imperial Royalties Co.
Indiana Truck Corp.
Ingersoll-Rand Co.
International Creosoting & Construction Co. 16
International Derrick & Equip. Co. ..120-121
International Harvester Co. of America.
International Nickel Co.
International Supply Co.

J

Jackson Engineering & Equip. Co.....222
Jarecki Mfg. Co.
Jefferson Union Co.
Jenkins Bros. 155
Jensen Brothers Mfg. Co.
Johns-Manville Corp.
Jones, S. M., Co. 233

K

Kansas City Hay Press Co.
Kaw Steel Construction Co. 8
Kellogg, M. W., Co. 233
Kelly Dempsey & Co. 122
Kelley, Kork
Kelly, John Eoghan
Kennedye-Plumb Corp.
Kennedy Valve Mfg. Co. 223
Kerotest Mfg. Corp. 124
K-W Ignition Corp., The

L

Lally-McKelvey, Inc.
Landis Machine Co. 81
Larkin & Co.
Layne & Bowler Co. 136
Leader Iron Works 227
Lehman Machine Co.
Liedecker Tool Co.
Leschen, A., & Sons, Rope Co. 109
Lientz, B. P., & Co.
Lincoln Electric Co. 150
Linde Air Products Co.
Link-Belt Co. 53
Lone Star Gas Co. 212
Long-Bell Lumber Co., The
Longyear, E. J., Co.
Lorraine Corp., The 152
Lucey Mfg. Corp. 161
Ludlow Valve Mfg. Co. 4
Lufkin Fdy. & Machine Co.
Lufkin Rule Co. 234
Lunkenheimer Co. 226

Mc

McCord Radiator & Mfg. Co. 5
McEvoy, J. H., & Co.
McGregor Working Barrel Co.
McIntosh & Seymour Corp.
McKee, Arthur G., & Co.

M

M. & M. Mfg. Co., The
Mack-International Motor Truck Corp...
Macwhyte Co.
Madison-Kipp Corp.
Magnolia Petroleum Co.
Maloney Tank Mfg. Co. 177
Marion Machine Fdy. & Supply Co..... 28
Marsh Gauge Pole Co.
Mason Regulator Co.
Mathieson Alkali Works, Inc.
Merco Nordstrom Valve Co.
Merrill Company, The
Metric Metal Works 87
Mid-Continent Oil & Gas Assn. 180
Midwest Piping & Supply Co.
Miller Improved Gas Engine Co.
Milton, S. G., & Son
Mission Sales Co.
Moon Mfg. Co.
Moore, Lee C., & Co., Inc. 95-96
Moore Drop Forging Co.
Myers, F. E., & Bros. Co. 234

N

National Carbon Co., Inc.
National Petroleum Engineering Co.....234
National Supply Co. 99
National Transit Pump & Machine Co..74-76
National Tube Co.
Neilan, Schumacher & Co.
Newton Process Mfg. Co.
New York Rubber Corp.
Norris Brothers, Inc.
Norris, W. C. 131
North American Car Corp.
Northern Pump Co.
Northrup Equipment Co. 110
Novo Engine Co.
Nuttall, R. D., Co.
Nye Tool & Machine Works 7

O

Oakite Products, Inc. 159
O'Brien Steel Construction Co.
Ohio Injector Co., The
Oil City Iron Works, Inc. 127
Oil Conservation Engineering Co.
Oil Country Specialties Mfg. Co. 218
Oil Insurance Association
Oil Well Improvements Co., The
Oil Well Supply Co. 68-69
Oklahoma Contracting Co. 26
Oklahoma Gas & Electric Co.
Oklahoma Portland Cement Co.
Oxweld-Acetylene Co. 60

P

Page, H. W., Inc.
Page Steel & Wire Co.
Palmer Corp., The 219
Parkersburg Machine Co. 181
Parkersburg Rig & Reel Co. 65
Parsons Co., The 226
Patrick, R. S. 171
Patterson-Ballagh Corp. 12
Pattin Brothers Co. 170
Penberthy Injector Co. 16
Petroleum Appliance Co.
Petroleum Iron Works Co.
Pforzheimer, Carl H., & Co.
Philadelphia Gear Works
Phillips Petroleum Co. 23
Pittsburgh-Des Moines Steel Co.
Pittsburgh Equitable Meter Co. 77-78
Pittsburgh Steel Products Co. 217
Pomona Manufacturing Co.
Powell, William, Co.
Power Piping Co. 225
Prescott Co., The
Prest-O-Lite Co., Inc., The
Pure Oil Co.
Pyle-National Co.

Q

Quaker City Rubber Co.
Quigley Furnace Specialties Co.

R

Reading Iron Co.
Reading Steel Casting Co., Inc.
Regan Forge & Engineering Co.
Reid, Joseph, Gas Engine Co. 154
Reo Motor Car Co.
Republic Iron & Steel Co.
Republic Supply Co. 157
Reserve Natural Gas Co. 231
R-F Electrical Mfg. Co.
Ridge Tool Co.
Riter-Conley Co. 233
Robinson Orifice Fitting Co.
Rock Island Plow Co.
Roots, P. H. & F. M., Co.
Ross-Meehan Foundries 233
Ryerson, Joseph T., & Sons, Inc. 232

S

Safety Gas Main Stopper Co. 233
Safety Pulling Machine Co.
Shaffer, J. E., Co.
Shaffer Tool Works
Shaw, S. F.
Sheffield Steel Corp.
Sinclair Refining Co. 195
Sivyer Steel Casting Co.
Skelly Oil Co.
Skinner, M. B., Co. 213
Smith, A. O., Corp. 10-11-169
Smith Separator Co. 13
Smooth-On Mfg. Co.
Sonner, P. J., Gas Burner Co.
Sootless Spark Plug Co.
South Chester Tube Co.
Southern Cornice Works 234
Southwestern Engineering Corp. 43
Spang & Co.
Spang, Chalfant & Co., Inc. 24
Standard Seamless Tube Co.
Standard Steel Works
Star Drilling Machine Co. 132
Staytite Co., The
Stockham Pipe & Fitting Co.
Stork Engineering Co.
Strom Steel Ball Co.
Sullivan Co., The 214
Sullivan Machinery Co. 147
Sun Shipbuilding & Dry Dock Co.
Swartwout Co., The
Sweet, Wm. J., Foundry Co.

T

Taubman Supply Corp. 176
Taylor Instrument Companies
Templeton, Kenley & Co., Ltd.
Texas Creosoting Co.
Texas Gulf Power Co.
Texas Pacific Coal & Oil Co.
Thermoid Rubber Co. 205
Timken Roller Bearing Co. 30
Titusville Forge Co.
Titusville Iron Works 118
Toledo Pipe Threading Machine Co.....225
Traction Machine Co., The
Trimont Mfg. Co.
Trumble Gas Trap Co. 223
Tulsa Pipe & Supply Co., Inc.
Tulsa Sheet Metal Co.
Twin Disc Clutch Co.

U

Union Gas Corp. 199
United Air Cleaner Co.
United Iron Works, Inc. 158
Universal Oil Products Co. 49

V

Victaulic Co. of America 63
Victor Balata & Textile Belting Co.....
Vogt, Henry, Machine Co.

W

Wagner Electric Corp.
Wailes Dove-Hermiston Corp. 17
Walworth Co. 1
Warren Petroleum Co.
Washburne, Chester W. 234
Waukesha Motor Co.
Westcott & Greis
Westinghouse Electric & Mfg. Co.....220
West Texas Utilities Co.
Whealton & Townsend, Inc.
Wheeling Steel Corp.
Wico Electric Co. 27
Widdell Engineering Co.
Williams, J. H., & Co.
Williamsport Wire Rope Co.
Williams Bros., Inc. 219
Williams Tool Corp.
Wilson Oil Tools Corp. 19
Wilson-Snyder Mfg. Co.
Wilson Welder & Metal Co., Inc.
Witte Engine Works
Worthington Pump & Machinery Corp...149
Wright, Horace 223
Wright Mfg. Co.

Y

Yale & Towne Mfg. Co.
Young Engine Corp.

Z

Zero Hour Torpedo Co. ....
Zwetsch Heinzelmann & Co. 234

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TABLE OF CONTENTS

SPECIAL ARTICLES

Increased Production for Week Only 35
By James McIntyre
Curtailment in Winkler County cuts total.

Natural Gas Men Rally at Dallas 37
By Andrew M. Rowley
Would protect public against promotion schemes.

Natural Gas Meeting Significant 37
By Col. Oscar H. Fogg

Increase Oil Recovery, Conserve Gas 38
Report of subcommittee of California operators.

Preliminary Program for Colorado Springs 38

Would Limit All Little River Wells 39
By J. L. Dwyer
T. B. Slick suggests 50-bbl.-a-day maximum for 90 days.

Eastern Engineers to Meet at Bradford 39

Greater Gallonage in Middle West 40

Increased Use of Gas for Oil Recovery 41
By E. O. Bennett

Improving Natural Gas Use 41
By R. M. Conner

New Peak for Mid-Continent Refiners 42
By C. O. Willson
More crude run to stills than any previous period.

May Amend Hendricks Proration Basis 46
By James H. Dameron

Field Problems and Their Solution 73
Edited by Thomas F. Smiley

Natural Gas Men Complimented 79
By Alexander Forward

Employes Performance in Gas Service 80
By R. W. Hendee

Gas Sands in South Texas Fields 80
By J. Boyd Best

Major Enterprise in Natural Gas 82
By Tolbert R. Ingram

Denver Gas Line Great Engineering Feat (With Map) 83
By Tolbert R. Ingram

Accurate Estimates of Gas Reserves 86
By C. P. Parsons

Bureau of Mines Statistics for March 89-92

Limiting Factors in Gas Projects 94
By P. McDonald Biddison

Sales of Gas to Industrial Plants 94
By F. Y. Hutchinson

Use of Siphons for Handling Water 108
By C. P. Parsons

Flow of Gases Through Small Orifices 111
By E. L. Rawlins

Pipe Line Corrosion and Protection 114
By W. G. Hagan

Orifice Meter Measurements 114
By John C. Diehl

More Common Commercial Gas Fuels 116
By Lawrence H. Dalman

Gas Pressure Regulation 119
By F. I. Thompson

Change to Natural Gas Supply at Denver 132
By Tolbert R. Ingram

Rapid Corrosion Test for Gasoline 162
By H. P. Rue
Method involving use of metallic mercury.

Pressure Base and Measurement of Gas 164
By D. A. Sillers

Problems in Measuring Wet Gases 188
By R. D. Turner

Industry Should Foster Air Travel 201
By C. O. Willson
Standard of Indiana confident plane will be major consumer.

New Cast Pipe to Help Meet Corrosion 228
By Gray I. Morriss

FIELD OPERATIONS

Texas Panhandle and North Texas 47
By James H. Dameron

West Texas 48

Late Fields 46

Oklahoma 50
By J. L. Dwyer

Kansas 52

Southwest Texas 54
By B. D. Stevenson

North Louisiana-Arkansas 57
By D. H. Bancroft

Gulf Coast 59
By Neil Williams

Muskegon, Michigan 59

Rocky Mountain Area 61
By Tolbert R. Ingram

Canada 62
By Victor Lauriston

California 64
By L. P. Stockman

Kentucky-Tennessee 66
By Whit

Central West 66

Eastern Fields 70
By D. S. Wakenight

REFINING AND MARKETING

Strong Demand for Oklahoma Gasoline 36
By W. T. Ziegenhain
Prices advance as large volume of orders is taken.

Technical Questions Answered 168
By Dr. C. K. Francis

Active Demand in Chicago Market 186
By J. B. Waldo

Gasoline and Kerosene Strong in East 187

Brief Items for Petroleum Refiners 190

Natural Gasoline Manufacture 191

Refinery and Crude Prices 192-193

Tank Wagon Quotations 194

Of Interest to Sales Departments 206

Methods of Measuring Detonation 208
By Neil MacCoull

ARTICLES OF GENERAL INTEREST

The Advertisers' Index 33

Equipment and Supplies 76

Natural Gas Developments 79

Men Known in Oildom and Personals 134

Classified Want Advertisements 184-185

Oil Securities Not So Active 198

Crude Petroleum Statistics 236

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Refinery Section Starts on Page 186

Increased Production for Week Only

Highest daily average estimated total production in 1927, week ended July 30, 2,587,105 bbls. Lowest in 1927, Jan. 22, 2,360,789 bbls.

Curtailment in Winkler County, Texas, This Week Cuts Total in United States to Low Point for 18 Months

By James McIntyre

Highest daily average estimated light oil production in 1927, week ended July 30, 2,102,385 bbls. Lowest in 1927, Jan. 1, 1,790,729 bbls.

The more than 50,000-barrel increase in average daily crude oil production the past week need not alarm the industry, as the average for the week ending May 12 will be even lower than that for the week ending April 28, and the following week should show a further decline.

Last week's increase was caused principally by the opening up of wells in Winkler County, Texas, for proration purposes, but when the week closed the production in Winkler was cut down from a peak of 321,810 barrels to 175,000 barrels, the latter figure being 78,000 barrels a day less than the average production for the week ending May 5. Then the 175,000-barrel production was cut to 143,695 barrels, which made the production of the United States on May 7, 2,345,000 barre's in round numbers, a lower point than it had reached at any time this year or last year and down to where it was early in November, 1926, the difference being that then every pool outside of California and Wyoming was producing its limit while now we are keeping a known reserve in the ground in several producing areas.

The proration test showed that Winkler County has a potential production of 521,000 barrels a day and emphasized the necessity of maintaining production measurable with the industry's crude requirements.

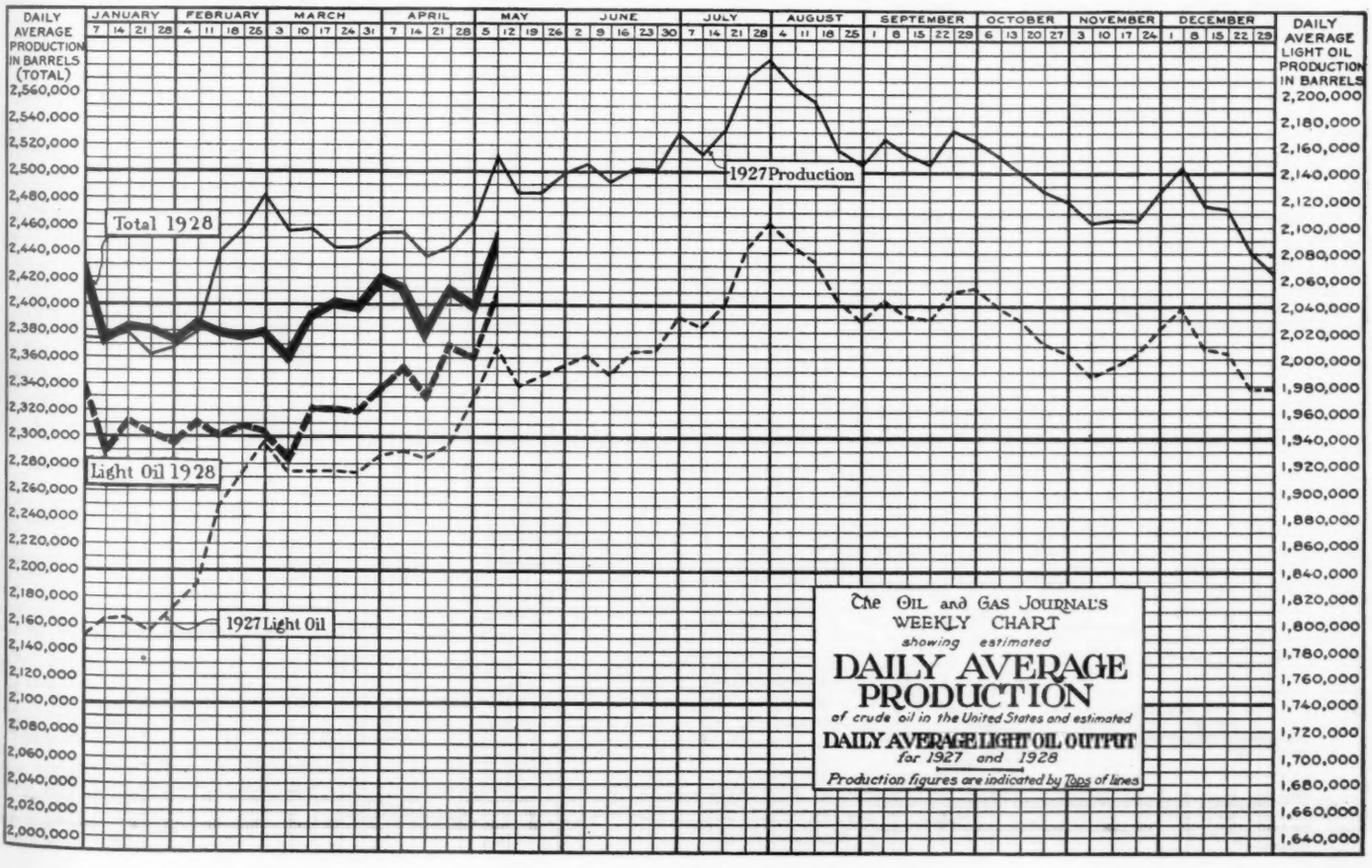
The importance of producing oil sanely, was never greater than now. The production of the more desirable "sweet" crudes is declining slowly but steadily. In fact, it has fal'en 273,833 barrels per day below the peak output of high quality crude in midsummer last year, but production would be increased by ill-advised recovery policies. Curtailment of production is as important in the flush high-grade areas in Oklahoma as it is in the sulphur-crude areas of West Texas or in the fields of California. This condition is recognized by most oil operators and their willingness to handle the situation wisely is expected to lead the industry to better times in the not far distant future. West Texas operators following the lead of California, Wyoming and Seminole oil producers, have grasped the situation and taken the proper means of saving it.

PRODUCTION IN THE UNITED STATES

Estimated daily average production of light and heavy gravity oil in the United States for week ended May 5 and a comparison with the previous week follows:

	May 5		Apr. 1	
	Light	Heavy	Light	Heavy
Oklahoma—				
Tonkawa	14,070	.....	14,340	.....
Burbank	35,890	.....	36,630	.....
Other Osage Fields	28,865	.....	28,890	.....
Cushing and Shamrock	20,320	.....	20,315	.....
Bristow	23,900	.....	23,910	.....
Seminole	280 825	.....	273,595	.....
Northern Miscellaneous	155,170	.....	153,110	.....
Southern Fields	58,400	.....	58,730	.....
Total Oklahoma	617,440	.....	609,420	.....
West Texas—				
Hendricks	253,000	.....	215,632	.....
Yates	50,167	.....	51,800	.....
Remainder	103,151	.....	104,392	.....
Total West Texas	406.318	.....	371,824	.....
North Louisiana	38,050	6,765	39,170	7,310
Arkansas	24,015	60,090	20,550	57,945
North Central Texas	132,823	.....	133,049	.....
Texas Panhand'e	68,590	.....	69,615	.....
East Central Texas	23,058	.....	23,237	.....
Kansas	110,985	.....	110,945	.....
Total Mid-Continent Area	1,421,279	66,855	1,377,810	65,255
Gulf Coast	.....	128,310	.....	125,421
Southwest Texas	.....	26,563	.....	26,606
Eastern	109,000	.....	106,500	.....
Rocky Mountain Area	81,047	.....	81,105	.....
California—				
Santa Fe Springs	37,000	.....	37,000	.....
Long Beach	175,000	.....	169,500	.....
Torrance	2,000	16,500	2,000	16,500
Huntington Beach	55,250	.....	55,500	.....
Dominguez	12,250	.....	12,250	.....
Inglewood	18,000	11,000	18,000	11,500
Ventura Avenue	49 000	.....	50,000	.....
Seal Beach	38,750	.....	39,250	.....
Remainder of State	58,000	149,250	60,000	150,250
Total California	445,250	176,750	443,500	178,250
Total United States	2,056,576	398,478	2,008,915	395,532
Grand Total	2,455,054		2,404,447	

→ **Total Increase, 50,607 Bbls.; Light Oil Increase, 48,661 Bbls.** ←



Strong Demand for Oklahoma Gasoline

Prices Advance as Large Volume of Orders Are Received. Fuel Oils Continue to Soften. West Texas a Factor

By W. T. Ziegenhain

Gasoline orders in Oklahoma were received in even greater numbers during the past week and most refiners have posted higher quotations. The demand has been above expectations and because the orders bear "rush" instructions in most cases, it is likely the material is moving for immediate consumption rather than into jobbers tanks as stocks. As a result, there is no hesitancy on the part of refiners to turn down business under the well-defined market prices. Natural gasolines did not show similar strength but by the end of the week there will likely be a movement under way which may cause prices to advance. Production has shown a decline over the first three months of this year according to the Bureau of Mines reports and with a period of high consumption ahead, some manufacturers have resumed buying on the spot market to supply current needs and have been hesitant to withdraw from storage. There is a strong possibility for prices to show a sharp turn upward over the next two weeks.

Kerosene showed additional strength. While there was no increase in the demand as shown from shipments, the price was advanced and the higher quotations were generally adopted and the market was well supported. Gas oil showed a decided strengthening despite the weaker fuel oil market. Gas oil was being purchased by several refiners for cracking and while the quantity was not great it may be taken as a turning point in the changing price structure where a refiner may profitably crack gas oil after paying the freight and as gasoline prices advance this product will probably show similar strength.

Fuel oil prices, particularly the heavier grades, witnessed a new recession in price. Competition with West Texas and Panhandle fuel has become more keen in the Chicago territory and as production is increased in the entire Mid-Continent the future of fuel oil prices does not present the same optimistic view that the oil market does in general. Lubricants moved in greater quantities and there is a tendency for prices to advance on the more viscous grades but as yet the general market can only be termed firm.

Wax inquiries have slowed down somewhat in numbers and there is more resistance to higher prices, but there is no tendency on the part of refiners to sell under the present market.

With consumption of gasoline higher than has been generally anticipated at this period of the year, refiners are optimistic regarding the immediate future. Many are considering the adoption of 7¼ cents on the 58-60 U. S. Motor grade and a few are already quoting this price. The resistance to higher prices is becoming stronger, however, and price advances are being given more careful study. Crude runs in the Mid-Continent for this month will be the highest they have been in the history of the industry and if refinery prices continue to strengthen there is likelihood of increases being made during the month not anticipated when reported on the first of May. Refinery crude runs will approximate 479,000 bbls. daily, the highest previous month being August of last year when 458,000 bbls. were run daily.

May's runs will also be 24,000 bbls. more than the April runs and while this represents a substantial increase, can be readily justified by the increased consumption of gasoline. Over the first five

(Continued on Page 204)

REFINED MARKET BAROMETER

The upward trend in the refined oil market over the past month has shown a tendency to slow up during the last week in practically all refining centers except the Mid-Continent. Gasoline movements have been above expectations, however, and still higher prices are anticipated. Natural gasoline witnessed a slight recession in the price on the better grades in the Mid-Continent, and California's increased production threatens future prices there. Fuel oils continued to weaken. A 10-cent reduction was made in the bunker fuel price along the Atlantic Seaboard during the week, and while this was unexpected, it reflects the conditions caused by the refining of increasing amounts of West Texas and Venezuelan crudes which yield a high percentage of fuel oil.

Mid-Continent—All grades of gasoline were advanced, with additional advances anticipated over the next few days. Kerosene has shown similar strength. Natural gasoline is plentiful, but a few of the larger manufacturers have entered the spot market to supply their needs instead of drawing on storage, and it is possible prices will take a sharp turn upward very shortly. Production has shown a decrease, and as the higher consuming season approaches, an advance is anticipated. Kerosene continued to advance. Fuel oil was offered more freely at reduced prices.

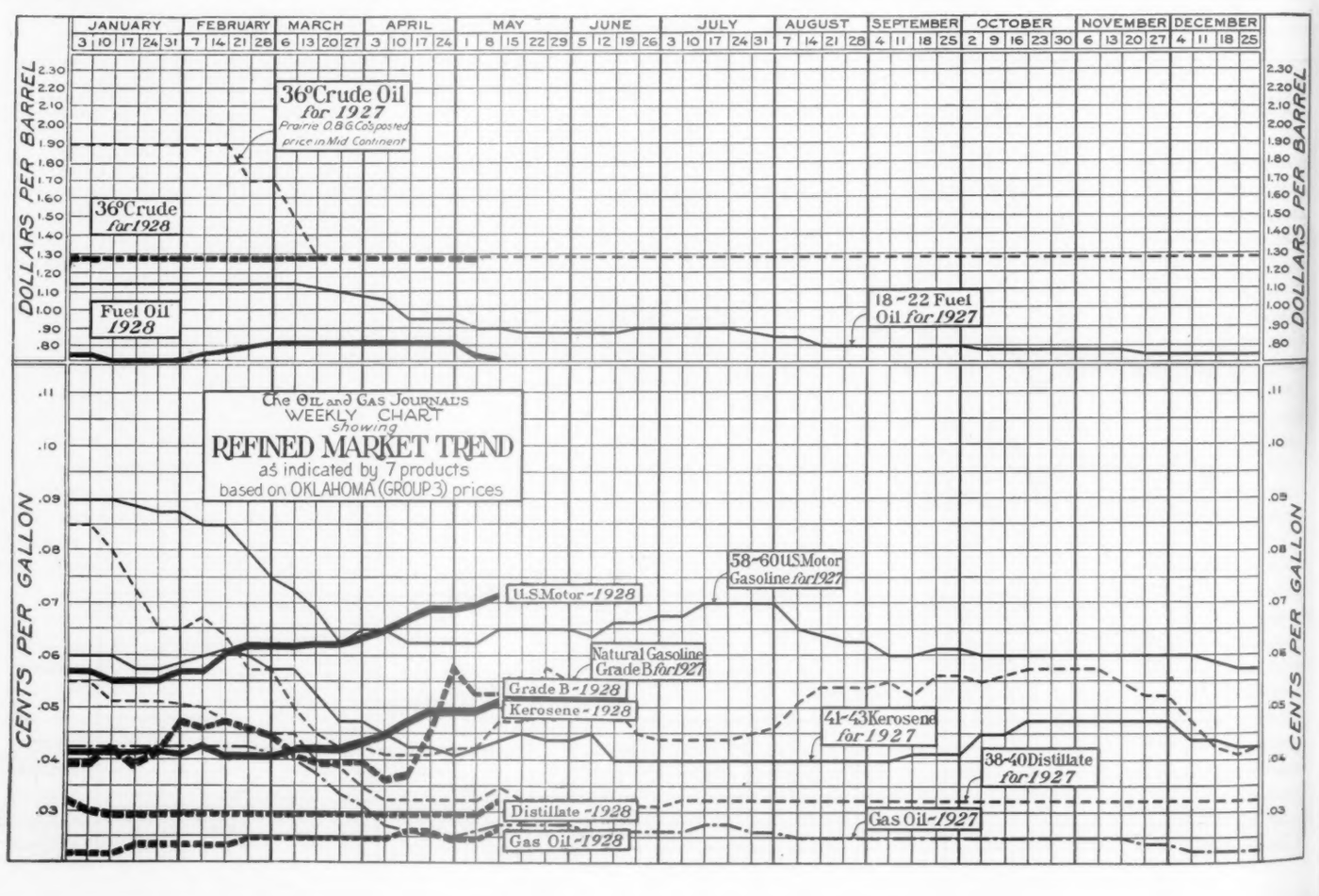
Atlantic Seaboard—Despite the 10-cent reduction in the bunker fuel price along the Atlantic seaboard, the general market continued to be viewed with optimism. Gasoline and kerosene offered the greatest promise of advancing over the immediate future.

Chicago—There were many orders received over the week for gasoline and kerosene, and the higher prices were well supported. Fuel oil did not show similar strength and, instead, could be purchased at price concessions.

Gulf Coast—Fuel oil was plentiful, and while prices remained unchanged, the future stability of the fuel market was uncertain. Other refinery products were in greater demand, and higher prices were posted on some lubs.

California—The general market remained unchanged with the exception of a tendency for natural gasoline prices to weaken as production was increased beyond the immediate demands.

Pennsylvania—Gasoline and kerosene shipments remained high, but there were no price changes. Wax inquiries became more numerous and higher prices are anticipated in the immediate future.



Natural Gas Men Out in Large Numbers

Dallas Convention Attended by Representative Men in the Industry. Would Protect Public Against Promotion Schemes

By Andrew M. Rowley

DALLAS, Tex., May 8.—United action by the natural gas industry against irresponsible parties who seek to foist franchises on an uninformed public, to the detriment both of the gas industry and the people it serves, was urged at the opening session here today of the first annual convention of the Natural Gas Department of the American Gas Association. It is the first meeting held by natural gas men from all sections of the United States and Canada since their organization merged with the the American Gas Association, the organization of the artificial gas industry.

Really this is the twenty-third annual convention of the Natural Gas Association of America. If there were even the semblance of a lingering doubt of this in the mind of anyone when he came here, it was removed when Miss Mary Spear, at the registration desk, said: "Hello Mr. ——, I am glad to see you." Miss Spear has been in charge of the registration of all Natural Gas Association of America conventions for years and every gas company executive knows her. I felt this was going to be a big meeting, but when I went to the manufacturers' building at the Texas State Fair Grounds and was greeted with: "Hello Andy, how is the Journal getting along?" I knew I was among home folk. It was a grand and glorious feeling, for the Natural Gas Association of America was the greatest organization in the world for real fellowship and the natural gas department of the American Gas Association is just the same crowd under a different name.

Crowding me at the registration booth

Samuel W. Meals

was Joe Creveling who keeps the Doherty interests in the forefront throughout the United States. I don't know Joe's real job, but whenever any city begins to itch for natural gas service, you will find Joe there giving the populace all the dope about the business and, eventually, signing them up for a contract. I believe I stated this wrongly—Joe usually decides when it is time for a certain city to itch for natural gas and he honors it with a visit to get it started on the right track.

Numerous Conferences

John Corrin and Christy Payne got in yesterday and were immediately the center of numerous conferences. John Corrin is unique in the natural gas business—that is, he occupies a position all by himself. His knowledge and acquaintanceship has made him probably the most powerful man in the entire organization. Yet John and his pipe can be seen drifting from one booth to another in the exhibit hall and every booth is the scene of a reception. He knows everyone and everyone knows him. John Corrin is typical of the natural gas industry represented here by more than 1,000 presidents, general managers and heads of departments of gas companies throughout the United States—he is in the business to give people the service of "nature's wonder fuel" at the lowest possible cost, and he does it.

Nearly everyone worthwhile in the natural gas industry is here. It is a real meeting and the papers being delivered together with the discussions make the attendance of their representatives a mighty good investment for the gas companies and one from which they should derive immediate benefit.

The Oil and Gas Journal publishes this week a majority of the papers being delivered at this meeting. All are especially good and deserving of careful attention and reading on the part of all persons connected with the natural gas business. Natural gas companies should see that employes who were unable to attend the meetings here have a chance to read the papers as published in this issue.

Gas Lift Model

The United States Bureau of Mines Experimental Station at Bartlesville, Okla., was represented by E. L. Rawlins and others. Eddie Rawlins has done a lot of real constructive work for the natural gas industry, especially in pointing out ways to combat leakage losses in transmission lines. The bureau has on exhibit here a model gas lift apparatus, showing methods employed in the Seminole oil field of Oklahoma.

Operation of the gas lift in numerous oil fields throughout the United States has opened a new field of endeavor for many natural gas companies and the subject is one attracting wide attention among companies having interests in or near oil fields.

Chairman McGowen's Address

N. C. McGowen, president of the Palmer Corp., Shreveport, La., and chairman of the natural gas department of the American Gas Association, struck the keynote of the meeting here today when in his address opening the convention, he said: "It is essentially important that we as an industry be so armed that if in the future we are confronted with the proposition of irresponsible interests going before the people of a city seeking franchises for the introduction of our product we can act intelligently and fight effectively. Remember that the citizens of these municipalities are uninformed about the natural gas business. They do not know that it is being managed scientifically to give them the best service possible, and being uninformed it is but natural that their action on such propositions often may seriously cripple and impair the investment of members of our industry who are already in that field. This is the question I shall call preparedness—preparedness with data and information on the natural gas industry as a whole.

"I believe this to be so serious that

Henry C. Morris

it warrants our action. Unfortunately we cannot prevent the inception of such schemes nor have we jurisdiction over those responsible for their inception. But we can correctly inform the public about them—show them where they are economically incorrect. To do this, however, we must have the necessary information at hand ready for instant use. No good for us to start frantically to gather it after such a scheme has been started in some locality. It must be gathered, assembled and compiled for our entire industry long before this time. Then, with this data available in one central place, we can intelligently launch our attack on such schemes wherever they appear and whenever they appear."

Mr. McGowen pointed out the benefits which have accrued already to the natural gas men from amalgamation of their association with the American Gas Association. In this connection he said: "The joining of the two associations has already been productive of beneficial results in many ways. To the splendid personnel of our main technical and research committee have been added the chairman and vice chairman of the association's technical section. This gives us a direct tie-in with all the technical work being done in the manufactured branch of our industry as well as a unification of effort in all lines of technical endeavor. In addition to this, more than 100 natural gas men have been added to association committees whose functions cover accounting, technical, industrial, commercial, publicity and advertising activities, as well as such important problems as accident prevention, scientific and marketing research, industrial gas research, rate fundamentals, rate structure, new heating problems, laboratory management, mixed gas research, taxation, depreciation and association finance. In fact every activity of the association is now being carried on by representa-

(Continued on Page 191)

MEALS AND MORRIS TO BE NEW OFFICERS

DALLAS, Tex., May 8.—Samuel W. Meals, president of the Carnegie Natural Gas Co., and head of all the natural gas interests of the Carnegie Steel Co., will be the next chairman of the natural gas department of the American Gas Association succeeding N. C. McGowen, president of the Palmer Corp., of Shreveport, La.

Henry C. Morris, president of the Dallas Gas Co., is the most prominently mentioned selection for the vice chairmanship which means if he is elected he will head the organization of natural gas men when Mr. Meals' term is ended. Mr. Morris has been active in the affairs of the natural gas association for years and was chairman of the committee on arrangements for this convention.

DALLAS NATURAL GAS CONVENTION HAS SPECIAL SIGNIFICANCE

By Col. Oscar H. Fogg*

President, American Gas Association, and Vice President, Consolidated Gas Co., New York

This convention of the Natural Gas Department of the American Gas Association is of more than ordinary interest and significance to the gas industry. It indicates an industry completely united in one great national organization, representing equally the natural and manufactured branches, and henceforth prepared to meet our problems together, and to speak with one voice and unified force for the gas utility services of the country.

The natural gas industry, like the manufactured gas industry, has entered upon a new phase. Scientific knowledge and training, and the instrument of the engineer have replaced the methods of other days. The accumulated capital of modern industry, necessary for development on a modern scale, have taken the place of the difficult and inadequate financing methods of an earlier time; the natural gas business has become an enterprise of definite foresight and planning; of engineering and ability; of exact and up-to-date accounting methods; of scientific rate making; of patient search for knowledge.

The natural gas industry has already impressively demonstrated its capacity to be of material help to the manufactured gas industry. You have brought into our ranks, and to service on our committees, men who do a lot of original thinking, who express freely their ideas, and who do not hesitate to disregard custom and venture fearlessly into new and untried fields. The access of this spirit has quickened the entire industry. Today it is alert with the spirit of study and research. From every division of the business comes the demand for exact knowledge upon which to plan for tomorrow and the day after.

As you know, the gas and electric utility services are now in the process of investigation by the Federal Trade Commission. No matter what our natural reaction may be to investigations of this nature, I can say for the American Gas Association that from the beginning we have welcomed the fullest scrutiny of all of our activities and affairs. We hope that this inquiry will be thorough and complete, and leave nothing to speculation or conjecture, for we know that we can await the result with confidence and pride, as in all of its work the A.G.A. has had nothing to conceal, and has been free at all times from practices which might bring it under public or official criticism.

So far as the eastern part of the natural gas territory is concerned, the problems arising from consolidation are now practically solved. All sections and all committees of the association contain adequate natural gas representation and these committee men have entered heart-

(Continued on Page 191)

*Before Natural Gas Department, A.G.A., Dallas, Tex.

Increase Oil Recovery, Conserve Gas

Prepared by the Subcommittee to California Operators General Committee on Gas Conservation

Probably no phase of oil production has been given more attention by the industry during the past few years than the function of gas in bringing oil from the sands. The importance of conserving gas underground and of maintaining proper gas pressure in the wells as the best means of obtaining the maximum amount of oil at the least cost has been demonstrated both in the laboratory and in the field. This work has been done principally by engineers and scientists of the large oil companies, and this paper presents briefly the consensus of engineering opinion on the various phases of gas utilization and make it available to all operators of California.

Included in these studies are the known facts on the effect of gas in solution in the oil under pressure, and results of gas injection for pressure maintenance for increasing the recovery of oil, for gas storage, and for the recovery of gasoline which would otherwise be lost. Methods of increasing the efficiency of production are also suggested.

At present and for the past seven or eight years, a large overproduction of gas has existed in California. All that cannot be sold for domestic and industrial consumption or used in the field for power production is blown into the air. Additional markets are now being sought and present markets may be expanded, but some time must pass before either can be accomplished.

Vital Interest in Conservation

The public has a vital interest in the conservation of this great natural resource and has spoken through the Federal Government and through the state governments of the oil-producing states, including California, urging that steps be taken to prevent the waste of gas. The oil industry also has a vital interest in conservation, both because gas is an income producing product and because by proper control and use it can be made to produce more oil with ordinary well equipment than under the commonly practiced inefficient method of taking the flush production as readily as possible. Production without gas control results in the unnecessary escape of gas and exposes the well to such hazards as collapsed casing, sand trouble, and rapid water encroachment.

It has been estimated in past years that with ordinary flowing and pumping methods, on an average, a comparatively small percentage of the original oil content of the sands is ultimately recovered; whereas with efficient control of gas production and pressure, together with proper well spacing, engineers now believe that the percentage recovered can be doubled. Likewise the ultimate production of fields already depleted of gas under ordinary methods can be increased by methods of gas injection and repressuring, and the suggested higher percentage of recovery approached, if not attained—although these methods result in a substantially high production cost.

The preparation of this paper was delegated to a subcommittee of the Operators General Committee on Gas Conservation. The latter committee was appointed by E. W. Clark, president of the American Petroleum Institute, to work on the problem of gas conservation in California. This committee after much study has decided that measures to conserve gas, if universally applied, will tend to stabilize oil production, allow the industry to regulate the supply to conform to demand, prevent the recurrent periods of excessive overproduction with consequent low prices, and insure to the public a longer future supply of petroleum products.

Importance of Natural Gas in Recovery of Oil

It is now generally recognized by oil operators that gas dissolved in oil is the principal factor in the movement of oil through sands into a well. The illustration, commonly used, of the soda water siphon filled with carbonated water being emptied through the glass tube by the pressure of the dissolved gas, may be used not only to explain how oil is forced out of a well once it enters the casing, but also to explain the more important step; the moving of the oil from its resting place in the pore spaces of the sand into the well casing and within reach of the operator.

Gas being the most important agent the operator has in moving oil from portions of the sand remote from the well, its efficient use requires that no more of it be allowed to escape than is actually required to move the oil into the well. Gas moves through the sand pores much more easily than does the viscous oil, and the tendency is for gas to bypass the oil, leaving it as dead oil in the pore spaces in the sand, recoverable only by slow gravity drainage or by encroachment of edgewater. Gas also has the property of lowering the viscosity (that is, increasing the fluidity of the oil), and enabling it, under high pressure, to flow through the pore spaces as readily as would gasoline.

The conservation of the energy contained in the gas associated with the oil is far more important to the operator in the long run than any immediate returns which he might receive from gasoline royalties or from the sale of residue gas to distributing companies. This is particularly true in the present situation when overproduction of both oil and gas exists with consequent inadequate prices for oil and natural gasoline.

Gas-Oil Ratio

The term "gas-oil ratio" has come into the language of the oil industry only within the past few years, and as with all new terms its meaning and its significance are sometimes not fully understood. Gas-oil ratio simply means the amount of gas which is produced from the sands with each barrel of oil.

Comparison of the results obtained in different fields and even in different areas in the same field show that gas-oil ratios vary widely from well to well. This variation is due, in large measure, to conditions over which the operator has no control. Among these conditions are the depth to the oil sand, the character of the oil, the natural pressure in the oil sand reservoir, the porosity of sands, the water conditions, and, above all, the original ratio of gas to oil existing in the oil-sand reservoir. It has also been observed that under a given set of physical conditions the gas-oil ratio is not constant for any one well, but varies throughout the life of the well, and also changes when the well passes from natural flow to gas lift and from gas lift to pumping.

Reservoir Pressure

The term "reservoir pressure" is applied to the gas pressure which exists in the oil-sand reservoir. "Rock pressure," "formation pressure," and "closed-in pressure" are other terms which have been used at one time or another to express the same idea, but "reservoir pressure" is thought to be the best term. In California fields the reservoir pressure usually varies with the depth to the sand, and it almost always happens that in thick sands or zones the pressure in the bottom part of the zone may be considerably greater than that on the upper part of the same zone. This reservoir pressure declines, of course, with the age of the well, just as the pressure in the soda water syphon goes down as the soda water (water and carbon dioxide gas) is drawn from the syphon. Therefore, when the reservoir pressure of a sand or zone is mentioned it commonly means the average pressure which exists at the given time in the oil-sand reservoir from which the well is producing.

The only means by which the rate of production of oil and gas, or either one, can be controlled is by offering resistance to the reservoir pressure which is attempting to empty the contents of the reservoir into the casing and thence into the flow tanks. Resistance to the reservoir pressure exists naturally in the sand as a result of the friction caused by the movement of oil and gas through sand and through casing and tubing. Additional resistances are added by the oil operator when he causes the well to flow through a bean or restricted orifice, when he maintains a pressure on the casing-head and gas separator, or, in the case of a pumping well, when the well is pumped with a high fluid level. The sum of all the resistances offered to the

(Continued on Page 142)

CALIFORNIA OPERATORS ASKED TO CO-OPERATE

In a statement addressed to California oil producers R. D. Bush, state oil and gas supervisor, writes:

E. W. Clark, president of the American Petroleum Institute, appointed an operators' general committee on gas conservation, consisting of representative members of the industry in the State, to co-operate with the gas conservation committee appointed by Governor C. C. Young. The accompanying paper has been prepared at the direction of the operators' general committee for the information of all producers as one means of greatly reducing the overproduction of gas if the methods described are generally applied.

Much has already been accomplished by some of the large companies in conserving gas, but it is necessary that the industry as a whole co-operate in this matter if the large overproduction of gas is to be eliminated. Much can be accomplished by individual effort, so that lack of co-operation on the part of your neighbor should not prevent the application of efficient methods in your wells.

It is obvious that if gas conservation measures are to be intelligently applied, the production of gas from each individual well must be measured, and for this reason the supervisor requests that hereafter you report to this department the monthly gas production of each well on the same form that the productions of oil and water are reported. If it is not possible to furnish individual well productions, the amount of gas by leases or groups of wells should be reported. This information will be treated in the same manner as all other records filed with this department.

PRELIMINARY PROGRAM PREPARED FOR COLORADO SPRINGS MEETING

The preliminary program for the semi-annual meeting of the divisions of Standardization and Development and Production Engineering of the American Petroleum Institute at Colorado Springs, June 12 to 15, has been issued by C. A. Young, director. As many of the members are active in both divisions June 12 and 13 have been allotted to standardization and June 14 and 15 to development and production engineering.

In the past it has been customary for the standardization division at its semi-annual meetings to have specially prepared papers on subjects relating to development and production practices. It has been suggested that the new division of development and production engineering take over this part of the program. For example, the division of development and production engineering has already appointed committees on drilling technique and production technique, which committees will undoubtedly include in their programs the utilization of A.P.I. standards and codes on field practice. Papers will be presented from time to time on the drilling and producing practices in the various fields, and in as much as its entire standardization program applies to drilling and producing only, this seems to be a proper field for the discussion of such subjects as the proper utilization of A.P.I. standards and codes. It will also serve to greatly extend the dissemination of information about the standardization program.

At the morning session on June 14, the various national chairmen on standardization will present brief reports of the results of their respective committee meetings. They will be followed immediately by a special paper relating to the advantages of standardization and making suggestions to the production engineering group. The remainder of the day will be devoted to committee reports of the production engineering group and general discussion. The program follows:

Morning Session

Committee reports by National Chairmen on Standardization.

"Adoption of A.P.I. Standard Equipment" by A. W. Peake, president, Dixie Oil Co., Shreveport, La.

Reports from various special committees (appointed at Chicago) of Division of Development and Production Engineering, as follows:

Committee on Rules and Methods of Procedure, Max W. Ball, chairman.

Committee on Standardization of De-

(Continued on Page 104)

Would Limit All Little River Wells

T. B. Slick Suggests 50-Bbl. a Day Maximum for a Period of 90 Days. Operators Will Meet Later in Week

By J. L. Dwyer

A meeting of the operators in the Little River Pool of the Greater Seminole Field held in Tulsa on Monday of this week made substantial progress towards extending the shutdown in that field for another 30 days after May 15 when the current agreement expires.

A feature of the meeting was a proposal of T. B. Slick, to shut in all the wells in the Little River Pool to a maximum output of 50 bbls. per day per well for a period of 90 days after May 15. This proposal had the support of many companies, although all of those present were not in position to vote upon this plan, which came as rather a surprise.

Mr. Slick, taking the floor when some question came up regarding the advisability of another extension of the Little River shutdown, stated that in his opinion the developments of last week including the finding of more production in some of the 10 test wells, had definitely demonstrated that all the wells in Township 7-6, should be placed in the same class, as it was no longer two separate pools, but one large pool which could easily develop a production of 150,000 bbls. daily in a short time.

Previously, the status of the township was that of a large pool in the north end around the discovery well of the Indian Territory Illuminating Oil Co. in Section 1, and a group of wildcat wells scattered through the section. The finding of good production in a straight line running southwest and northeast for over 2 miles, and east and west for three-quarters of a mile with nothing between to condemn or limit the possibilities, settled for all time the fact that this is one large operation, in Mr. Slick's opinion, and he stressed the fact that the most constructive action the meeting could do was to shut in all wells in Township 7-6, and all wells in the Little River part of Township 8-6, to the amount mentioned above.

Support Slick Plan

John J. Moran, president of the New England Oil & Pipe Line Co., part owners of a lease in this region gave hearty approval to Mr. Slick's plan, stating that it was unfair to the owners of leases in the south end of the township to shut in, when the wells in the north end of the township were flowing wide open.

Speaking in support of Mr. Slick's plan, Dana H. Kelsey said that the success of the Seminole operators in getting together on the first constructive plan of proration, had much to do with the attitude of other regions effecting similar programs, and that the work done in shutting in California fields, and also West Texas was to a certain extent reflective of the Seminole success. Among the others who spoke favoring the adoption of the Slick plan were R. M. Young, president of the Carter Oil Co.; Rush Greenslade, vice president of the Gypsy Oil Co.; J. C. Denton, vice president of the Mid-Continent Petroleum Corp. and R. B. Pringle, vice president of the Independent Oil & Gas Co.

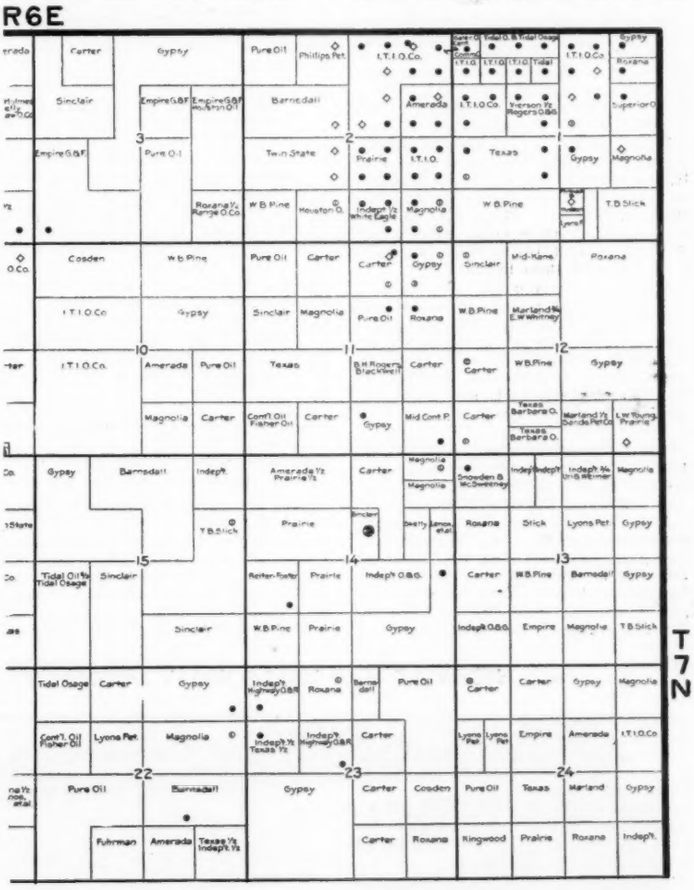
Ray M. Collins, umpire in charge of the Greater Seminole area, reported to the meeting that with the exception of the Reiter-Foster Oil Co., every company having interests in the Little River Pool was in favor of extending the agreement for 30 days after May 15, and said that before any thought should be given to the Slick proposal for shutting in all wells, efforts should be made to reconcile the one company, and make the 30-day extension unanimous. After a vote which was taken to sense the sentiment of the Slick proposal, the meeting adjourned until later in the week when a committee headed by R. M. Young will have called upon the one outstanding company and ascertained their attitude on the 30 day extension.

The vote taken to sense the sentiment of the Little River operators on shutting in the output of all wells to 50 bbls. per day for a period of 90 days after May 15 showed the following companies either absent or not voting: Marland Oil Co., Blackwell Oil & Gas Co., Barnsdall Oil Corp., Skelly Oil Co., Continental Oil Co., W. B. Pine, Sinclair Oil & Gas Co., and Lenox Oil Co. The remaining companies signified their approval of the Slick proposal.

To Cope With Allen Pool

A meeting of the advisory conservation committee of the Oklahoma-Kansas division of the Mid-Continent Oil and Gas Association held in Tulsa this week resulted in the formation of plans calling for the election of local committees to meet and cope with the Allen Pool of Seminole-Hughes-Pontotoc Counties in Oklahoma, and the Gorman area in Russell County, Kansas. The committee reported that efforts will be made to immediately set in motion committees in both of these pools to take the necessary actions for the slowing up of the drill.

The advisory conservation committee is composed of E. B. Reeser, president of the Barnsdall Oil Co., chairman; Dana H. Kelsey, vice president and general manager of the Prairie Oil & Gas Co.; John M. Lovejoy, vice president of the Amerada Petroleum Corp.; E. H. Moore, president of the Independent Oil & Gas Co.; Joe T. King, president of the Kingwood Oil Co.; Rush Greenslade, vice president of the Gypsy Oil Co. and Wirt Franklin, president of the Wirt Franklin Petroleum Co.



Township 7-6, showing the south end of the Little River Field proper, and the various producing wells which have such great potentialities.

EASTERN ENGINEERS WILL MEET MAY 17-18 IN HISTORIC FIELD

BRADFORD, Pa., May 5.—Oil producers, petroleum engineers and geologists from all over the fields east of the Mississippi River are expected to attend the two days' session of the Eastern District of the Division of Development and Production Engineering here, May 17 and 18. The division is a part of the American Petroleum Institute and this meeting is one of a number of regional meetings to be held in the different producing divisions of the United States this year.

Because of the peculiar subsurface conditions in the Bradford oil field and the ways and means of recovering a maximum of crude from the Bradford and Richburg sands, the Bradford Field and its neighbor, the Allegany Field, just over the line in New York State, have interested oil men all over the world.

World's Dominant Field

The Bradford Field was opened in 1875. It reached its peak in 1881 with an estimated daily production of 105,000 bbls. a day. By 1888 drilling had almost ceased in the area, the records showing that in April, 1888, only 4 wells were completed on the 105,000-acre structure. The production in 1881, given in pipe line runs, average 70,811 bbls a day, which was 93 per cent of all the oil produced in the United States that year, the Nation's total production having averaged 75,875 bbls. per day.

While Bradford was producing an average of 70,811 bbls., the other fields in Pennsylvania were producing an average of 4,189 bbls. per day. West Virginia produced 414 bbls. a day; Ohio, 93 bbls. a day; California, 273 bbls. a day. Oil had not yet been discovered in commercial quantity in New York, Indiana, Illinois, Kentucky, Michigan, Tennessee, Kansas, Oklahoma, Texas, Louisiana, Arkansas, Montana, Wyoming, New Mexico or Colorado, all of which are now oil-producing states. The Bradford Field was monarch of all it surveyed, producing about 83 per cent of all the oil produced in the world, Rumania, Russia, Canada and Galicia being the only foreign fields that produced crude in appreciable quantity as far back as 1881.

Flood Caused Revival

Forty years ago the daily pipe line runs from the field had fallen to 13,992 bbls. a day, and by 1906 the production had dropped to about 3,600 bbls. a day, out of a total of 350,000 bbls. a day for the United States. The old Bradford Field was regarded as a good old back number, a wonder field "in its day," but no longer regarded with serious consideration by outside oil men.

Then came the "flood."

The story of the discovery of the "flood" or "water drive" in Bradford has been told many times. Careless plugging of an abandoned well somewhere in the Duke Center district permitted fresh water from surface and springs to fill up the old hole. The heavy pressure, perhaps 1,200 pounds in that part of the field, forced the water into the sand, and in the course of time the owner of the oil wells in that lease began to note a large increase in oil production. Instead of being pleased with the discovery, the producer and others like him whose properties were affected by similar floods became panic stricken. They believed their properties were on the way to utter ruin. Some operators sold out as quickly as possible to others who believed they might turn the flood to profit. Oil men induced the Pennsylvania State Legislature to pass a law legalizing the flooding of oil sands in McKean County, and the production of the field mounted slowly.

Science Is Called In

Haphazard measures of creating floods gave way to practical production engineering and the engagement of geologists to study the structure and the best ways of recovering the production. Now the field is producing more than it did 40 years ago, and where four wells were completed in April, 1888, 107 were completed in April, 1928. From a low of 3,600 bbls. in 1906 production has increased to over 16,000 bbls. a day and is slowly but steadily mounting.

The Allegany field has also been greatly benefited by the flood. A small part of the Bradford Field extends into New York. The Allegany Field supplies all the rest of the oil production in the Empire State. In April 1928 New York State produced an average of 6,500 bbls.

(Continued on Page 204)

Greater Gallonage in the Middle West

Standard Oil Co. of Indiana and Pierce Petroleum Corp. Active in Encouraging Increased Motoring

The greater gallonage movement, the campaign to increase consumption by inducing car owners to get out and use their cars more, is spreading from the original vacation and tourist plan to the even more promising promotion of week end and evening neighborhood trips. The idea is to interest motorists not merely in a two weeks' tour but in almost every evening and week-end trips that in the aggregate would far exceed the demand from vacation tourists.

The Standard Oil Co. of Indiana has been active in both efforts. One medium it has been using is a map folder which opens with this greeting:

Just a Word

To the touring motorist, whether he be a carefree vacationist out to enjoy the clean fresh air, the sunshine and the thrill of mild adventure, or the busy man on business bent, highways are happy ways. To him the intricate network of motor trails that crisscross the Middle West are avenues of enjoyment. They lead him from place to place, every mile of which is full of interest.

To enable him to find his way through the maze of traffic ways easily and quickly, the series of maps (of which this is one) have been published by the Standard Oil Co. of Indiana. Every care has been taken to make these maps accurate and it is hoped that the motorist who gets them will find them helpful.

If at any time you are in doubt as to which of several routes you should take drop into any Standard Oil Co. of Indiana service station and ask the attendant. He usually is well informed as to road conditions in the neighborhood of his station and he always is glad to help make your touring a pleasant experience.

Another series of folders issued by the Indiana company covers points of interest in different states. For example:

Missouri Points of Interest

Historic and scenic points of interest, with brief description of oustanding features, together with most convenient approaches by automobile. (S) indicates locations of Standard Oil Co. of Indiana service stations.

Arcadia Valley: Surrounded by Ozark Mountains, offers the traveler an endless series of beautiful landscapes. The countryside is especially colorful, owing to the golden tone of the crumbling rock that shows on the face of the hills. Rich vegetation. Charming Lake Killarney. Good fishing in the rivers. Quail, squirrel, wild turkey abound. Enter at Ironton or Arcadia. Off M-21. North of Ironton is Pilot Knob, a shaggy peak, 1,600 feet elevation. It was named by Mississippi River pilots when river travel was in its heyday, from the fact that on clear days its sharp summit served them as a guide post.

Arrow Rock: Old Tavern erected on the old Santa Fe Trail in 1830. Off U. S. 40.

Carthage (s): The marble city and gateway to the Ozarks. Marble from its quarries is shipped to all parts of the world. U. S. 66, U. S. 71.

Dewitt: East of the town of Fort Orleans, one of the first white settlements north of the Missouri River in this State, identified by a monument marking the site. East of Carrollton on U. S. 24.

Excelsior Springs (s): One of the most noted health resorts in this country. It has within its boundaries 20 mineral springs and more kinds of water than any other resort in the world. Northeast of Kansas City on U. S. 69. On the main highway is an old cottage, Jesse James home, which was the home of the James boys, familiarly known as the "James Gang" (highwaymen) who terrorized Kansas and Missouri towns during the early history of both States.

Florida: Birthplace of Mark Twain. Mark Twain State Park on beautiful bluffs overlooking Salt River. Good camp. East of Paris, off U. S. 24.

Hahatonka: Hahatonka Springs lies in one of the most gorgeous natural scenes in the Ozarks and is yearly visited by thousands. M-5.

Hannibal (s): The home of the famous humorist, Samuel Clemens, who, under the nom de plume of Mark Twain, gave the world the typical life of the American youth in his day—Tom Sawyer and "Huck" Finn. U. S. 36, U. S. 61.

Hollister (s): In the rugged region of the White River nearby lies Lake Taneycomo, one of the largest power lakes in the Middle West, being 25 miles long. This lake, famed for its fishing and summer sports, is overshaded by huge peaks and heavy timberland. U. S. 65.

Independence (s): On Liberty and Kansas Street is the Weston Blacksmith Shop, a famous old building, constructed about 1840, known as the Chief Equipment Station for wagon trains setting out across the prairies for California and the gold fields. Here may be seen the oldest court house west of Mississippi River, built in 1828 at a cost of $150. Logs for the building were hewn by Samuel Shepard, a slave. U. S. 24.

Lamar (s): The country 10 miles north of here is noted for its scenic attractions, winding drives, moss covered bluffs, and lonely caves, which are intriguing to parties seeking the solitude and beauty of the wild wood. M-21, off U. S. 71. Four miles east of Lamar is an unusual formation of limestone, known to the natives as the Big Rock where the Spring River has eroded its way into the solid rock, by reason of the force given to the current during freshets, until the stream is semisubmerged beneath the limestone bluff. Ten miles west of Lamar is "a great prairie as Nature left it," covered with the natural wild grasses, absolutely treeless, and uniformly level. Especially attractive during the fresh and alluring greenness of early summer.

Leeds: This is a noted greenhouse center, containing probably more greenhouses in proportion to its size than any other town in the country. Leaf lettuce is a specialty. Besides lettuce, there are many flowers, vegetables, and many other important products cultivated within the bounds of the little town.

Historical Spots

Lexington (s): Located on the old battleground of the Battle of Lexington which occurred September, 1861, between Federal and Confederate forces. The trenches and earth fortifications are still plainly visible on the battleground which is suitably marked by a handsome stone memorial. U. S. 24, M-13.

Lone Jack: The Battle of Lone Jack was fought on Saturday, August 16, 1862, between the Confederate and Federal

(Continued on Page 197)

SAYS OIL AND MOTOR COMPANIES SHOULD ALL PLAN CAMPAIGN

From the Manufacturers Record

The Standard Oil Co. has begun an active publicity campaign in behalf of New England. This is a novel and remarkable piece of work for one of the great organizations of the country to take up, but if the Standard Oil Co. can find it profitable—and we doubt not it will do so—to advertise New England in the way that it purposes to do, we trust that it and other organizations who have hundreds of millions of dollars at stake in the South will begin a similar campaign for advertising this section. The great oil companies who have vast refinery interests in the South and hundreds of millions of capital invested in this section could well afford, we think, to follow the example of the Standard Oil Co. as to New England and spend some hundreds of thousands of dollars in publicity work in behalf of the South.

We congratulate the Standard Oil Co. and New England upon this movement. It will redound to the good of both. At the same time we would strongly urge that this new and remarkably interesting undertaking by one company be carried out as to the South by many companies; and to the Standard Oil Co., which is so heavily interested in the South, we would strongly urge a similar publicity campaign in behalf of this section.

In this heavy advertising campaign of the attractions and advantages of New England, the Standard Oil Co. is laying special stress upon the desirability of that section as a summer resort and advising people to motor there this summer. Great good will be done to New England. At the same time the increased consumption of gasoline brought about by these advertisements will doubtless repay the Standard Oil Co. many times over, also help other oil and gasoline companies and likewise the motor industry generally. Why should not the great motor building companies of the country, instead of specifically advertising their own cars, occasionally heavily advertise the desirability of motor trips to different parts of the country? There are magnificent mountain resorts and marvelous mountain scenery in the Virginias, the Carolinas, and in Georgia and Alabama, as well as in more distant southern states, pre-eminently desirable for summer motoring. Why should not these gas and oil companies advertise these sections as the Standard Oil Co. is advertising New England for motoring, and why should they not all plan for a heavy campaign of this kind to encourage motoring throughout the South next fall and winter?

HIGHWAY MAP TELLS WHAT MOTORISTS WANT TO KNOW

Pierce Petroleum Corporation map billboard erected to promote greater gallonage.

Increase in Use of Gas for Oil Recovery

Its Economic Effect on Natural Gas Industry. Less Efficient Use of Gas Paid for in Oil Left in Ground

By E. O. Bennett*
Marland Oil Co.

During the early days in the oil industry natural gas, especially that accompanying oil produced was considered of little or no value and was looked upon as a necessary evil to be got out of the way as soon as possible.

Today the efficient oil producer recognizes gas as the all-important agent in helping him get his share of oil contained in a subsurface structure into which he may drill.

The natural gas industry is interested in gas as a commodity for the energy it can liberate as heat when burned in a proper manner. The oil operator is interested in this same gas, before it reaches gas distribution systems, not for its calorific value but for the potential energy it contains due to the pressure at which it exists and due to its effect upon the migration of oil through porous sand bodies.

Gas referred to in this paper is that in contact or associated with oil and not that in isolated gas sands. It is principally casinghead and residue gas.

Between the oil producer and the natural gas consumer there is the natural gasoline manufacturer who is interested in the gas from another viewpoint; that of extracting the condensible vapors carried by the gas, in the form of gasoline.

In most cases natural gas associated with oil can be made to do much more work before it leaves the oil property, never to be returned, than it has been called upon to do in the past.

It has been proven conclusively, by numerous experiments and tests, that natural gas dissolved in oil keeps the oil in condition such that its fluidity is greater and its viscosity less. At the same time this is accomplished the gravity of the oil is increased.

The resistance to flow of oil through a sand is governed largely by the viscosity of the oil and its surface tension, both of which are affected by the amount of gas kept in solution in the oil. The viscosity is reduced with increased saturation while the surface tension is increased.

Jamin Effect

Another very important factor concerning the flow of oil through a porous medium is the blocking of pore space with gas which comes from the oil. This is called the Jamin effect, after its discoverer. It is definitely known that if certain rates of flow are exceeded, gas in solution will leave the oil and will occupy the pore space making the flow of oil very difficult. This effect is very serious and can only be controlled by proper pressure differential across the sand through which it is moving. The differential can be controlled by proper back pressure regulation.

The amount of gas which can be dissolved in any oil is governed mainly by the composition of both the gas and the oil, also by the temperature and pressure condition existing. The rate at which gas will dissolve in oil under the above conditions is a function of time and the amount of agitation occurring. If the gas and oil are violently agitated so as to bring the entire volume of each into intimate contact saturation will take place in a very short time. This can be readily demonstrated in the laboratory and would tend to make one very enthusiastic over the use of gas for oil recovery, especially as applied to properties where the original gas contained has been exhausted.

Unfortunately it is practically a physical impossibility to replace gas in solution in the oil remaining in a subsurface structure as no agitation can be made to take place. The gas will go into solution without agitation if permitted to remain in contact long enough. The rate, however, is very slow and the time required makes it economically impractical to try to change the character of the oil by saturating it with gas while it is in the sand.

To Derive Greater Yield

The above actions, however, indicate what may be done to derive the greatest ultimate yield of oil from a given pool and can be stated—"Keep all gas originally in solution, in the oil as long as possible permitting the least amount to escape and when any does escape make it do its maximum amount of work in moving oil to the well."

To accomplish this may mean a decrease in the rate at which oil should be produced from a given structure with a consequent decrease in the amount of gas accompanying the oil and in most all cases with less gas per barrel of oil produced. When this is done a part of the gas which would ordinarily be produced with each barrel of oil is left in the formation to help remove other barrels of oil.

Controlling oil production so that maximum efficiency regarding gas dissipation is reached, will have a decided effect upon the natural gas merchant and the gasoline manufacturer. Instead of having to install equipment to take care of large volumes during the early life of a field and very small amount later, they can each put in average capacity equipment with assurance of longer life in production. This will yield much greater returns on the initial investment with a stable source of supply to meet market conditions over a longer period of time. A uniform rate of production will also have a tendency to stabilize the price of the products. A great amount of attention has been given to increasing the recovery from old depleted properties by the injection of gas and air for oil recovery purposes while but little thought has been given to maintaining during flush production the most favorable conditions for ultimate recovery.

Maintaining Pressure on Flush Production

Results obtained during the past few years have proven beyond any doubt that for greatest ultimate recovery there is a best rate of production from each and every well. This rate is the one which will yield the greatest amount of oil with the least amount of gas from the oil-bearing formation.

The minimum amount of gas that can be produced with each barrel of oil is governed by natural conditions existing and may vary considerably from place to place.

Measure of Efficiency

The most economical production of both oil and gas will be obtained when the amount of gas produced approximates that originally in solution in the oil reservoir which was drilled into.

The only way in which the actual amount of gas dissolved in the oil can be determined is to take an actual sample of the mixture as it exists in the bottom of the well. A thiefing device recently has been designed and perfected which permits obtaining a true sample from the bottom or any other point in a well. The same device records the true pressure and temperature existing at the point where the sample is taken.

When the sample of oil with its original gas in solution is brought to the surface the amount of gas contained in it is drawn off, and metered, after which the volume of oil is measured. The condensible gasoline is also extracted by activated charcoal. These data then afford a means of obtaining the true or formational gas-oil ratio and give an index or a means of determining the best conditions under which the well can be operated. To determine the conditions of the well throughout its life the gas-oil ratio may be compared to that obtained during the early life of the well. It is extremely desirable to determine the first set of measurements as soon after a well has been completed as possible.

Bottom pressures vary widely from those calculated from known well head pressures on account of the variable amounts of gas produced with the oil. If the true amount of gas produced with the oil and the fluid lever are known bottom pressures can be calculated with a fair degree of accuracy.

Returning Gas to Formation

It has been found in practice that it is impossible to return as much gas to an oil producing stratum as was taken from it unless the original pressure conditions are greatly exceeded. From this fact it can be seen that there is a possibility of retaining pressures existing at or near original values, although large quantities of oil have been removed.

It gas taken from a well producing oil is returned to the sand as soon as possible after a well is drilled in and allowed to produce, there is a good possibility of retaining pressures approximating those originally existing in the area. When natural decline starts under these conditions it will be slower that a normal decline observed in ordinary production practice all of which will help increase ultimate yield. Since this method of handling production is new and but little data are available the exact time to start repressuring and the pressures which should be maintained have not yet been determined. Indications are, however, that the earlier repressuring operations are started the greater will be the economic gain. Data observed where early repressuring has been practiced indicate that where the repressuring is started during the first 5 per cent of the normal life of a field, and carefully carried out, that the production during the next 15 per cent of the normal life of the field will approximately equal that which would ordinarily be produced during the entire life of the field, and that the ultimate production will be from 200 to 300 per cent more than under conditions where gas is not conserved.

Repressuring during the period of production is at the present time being carried out with pressures up to 1,500 pounds and excellent results are being obtained. One of the greatest benefits of early repressure operations is the retarding of edge water encroachment and holding down bottom water coning, both of which will shorten the life of a producing formation by trapping off oil. Wells making water have been dried up when put under pressure control.

Early Reinjection

If early reinjections of gas is started oil in the sand will retain the gas it carries in solution for a longer period of time and will flow more freely through the sand to the well resulting in a great-

(Continued on Page 191)

*Before Natural Gas Department, American Gas Association, Dallas, Tex.

IMPROVING NATURAL GAS USE BY WORK OF GAS LABORATORY

By R. M. Conner*
Director, Testing Laboratory, American Gas Association

Like other progressive industries, the gas business several years ago came to a realization that one of the most essential factors in insuring its future progress was the successful utilization of its product. It was in recognition of this economic factor that a united industry established the gas appliance testing laboratory in Cleveland, Ohio, during 1925, and dedicated it to the improvement of its public service.

The former Natural Gas Association assisted financially in founding the testing laboratory. One of its past presidents has been chairman of the laboratory managing committee since its formation. While our establishment has always given fully as much, if not greater, importance to the solution of natural gas utilization problems than to the manufactured gas side, natural gas men can now, since the amalgamation of the two great associations, take an even greater interest than ever before in our testing and research programs.

National Regulation

The need for national regulation of our gas appliance situation was recognized for a number of years prior to the establishment of the laboratory. Many gas companies had long maintained laboratories of their own. These agencies served a very useful purpose, particularly in the solution of many of our production problems. As far as the appliance situation, however, was concerned, their findings anticipated only local conditions which were not of particular value to gas companies that did not maintain laboratories of their own and were operating under different conditions. The varying specifications of these agencies, as well as the individual preference expressed by countless dealers, naturally added to the production costs of gas appliances by increasing the number of manufacturing difficulties and preventing any comprehensive plan of standardization.

Standardization of our gas appliance manufacturing processes probably represents the greatest possibility for increasing efficiency and lowering production costs existing in that business today. One of our gas range manufacturers, for example, produces as many as 8,000 different kinds of ranges. It is only logical to assume that, in this age of standardization, such concerns naturally would feel the effects of competition very keenly. Any comprehensive testing program logically results in standardization but our manufacturer's section should consider the adoption of an effective program of this kind and work out the details of its application.

Our new laboratory when completed will be the largest and most completely equipped institution of its kind in the world. When finished, the gas industry will have expended approximately $1,500,000, which includes investments made by the appliance manufacturers in the interests of better public service.

Eighty-five and three-tenths per cent of all of the appliances submitted to our

(Continued on Page 199)

*Before Natural Gas Department, American Gas Association, Dallas, Tex.

New Peak for Mid-Continent Refiners

More Crude Oil to Be Run to Stills Than Any Previous Period. West Texas and Panhandle Expand

By C. O. Willson

Mid-Continent refiners during May will run more crude oil to their stills than any previous month in their history. Based on reports made to The Oil and Gas Journal, 105 refineries operating in the states of Oklahoma, Kansas, Arkansas, North and Central Texas (including West Texas), and North Louisiana will run to their stills an average of 479,225 bbls. daily. This exceeds the average of April by 28,000 bbls. daily and is approximately 22,000 bbls. greater than the average for August of last year which was the previous peak period in the history of the Mid-Continent Field.

Compared to a year ago, the May refinery operations are 71,870 bbls. greater based on an average daily operation as shown in Table 2. The May crude runs climax a steady gain since the first of the year, the January runs averaging 415,125 bbls. daily.

The present crude oil production of the Mid-Continent area is approximately 1,445,000 bbls. daily which means that the refineries in the field are refining 33 per cent of the current production. The remainder of the production is going to outside refineries or to storage located in or outside the Mid-Continent Field. There have been times in the past when the Mid-Continent refiners absorbed a larger percentage of the crude oil output. The present relative low percentage, despite the heavy refinery operations, is due to the heavy crude oil production in the West Texas and Seminole, Oklahoma fields.

Reasons for Increase

The large increase in crude runs to stills during the past month in the Mid-Continent Field can be explained as being due to the approach of the gasoline consuming season and also the fact that plant operations from a profit standpoint are in a more favorable position at this time than during any period in several months. Most refiners in the Mid-Continent Field at the present time figure their operation on the profit side. The steady advance in gasoline prices and a relatively strong kerosene market coupled with steady fuel oil prices during the past three months has materially improved the oil situation when considered from the angle of the petroleum refiner.

Refinery operations in the Mid-Continent Field through the winter months were maintained on a conservative basis. Government reports for other sections of the country indicate that this condition was general. Gasoline stocks have not been allowed to accumulate as in former years. This naturally means that as the summer demand for gasoline approaches an increase in crude runs to stills is to be expected. In the Mid-Continent Field those in touch with market conditions are hoping that the refinery operators will go slow in increasing their plant operations. As the seasonal demand for gasoline arrives, some increase in operations can be absorbed but a large increase would probably flood the markets with surplus products which would nullify the improvement of the past few months.

Oklahoma

Oklahoma operations for May will be on about the same basis as during April, there being a smaller increase in that State than in any other refining area. As will be noted in the detailed tables covering individual plant operations, several Oklahoma companies made small increases in their crude runs for May over April.

These increases were largely offset by a 5,000-bbl. decrease in the rated operations of the Marland Refining Co. at Ponca City. This company's operations early in April was fixed at 30,000 bbls. although the average for the month was 25,000 bbls., the same as the May operations.

RUNS TO STILLS AT MID-CONTINENT REFINERIES

1926	
April 1	368,210
May 1	391,355
June 1	415,450
July 1	410,070
August 1	407,475
September 1	419,995
October 1	408,975
November 1	417,575
December 1	403,450
1927	
January 1	403,625
February 1	418,595
March 1	418,920
April 1	401,860
May 1	407,355
June 1	426,170
July 1	428,075
August 1	457,800
September 1	422,150
October 1	420,955
November 1	426,654
December 1	417,455
1928	
January 1	415,125
February 1	418,275
March 1	427,145
April 1	451,225
May 1	479,225

North Central Texas

North and Central Texas including West Texas which is rapidly becoming a refining center had the largest increase for May over April. As in Oklahoma several of the companies made small increases in their plant operations. Large increases at three or four plants with the resumption of operations at plants which had been shut down account for a substantial part of the increase.

In the Panhandle area, the Phillips Petroleum Co. boosted its runs from 3,500 bbls. to 7,500 bbls. daily. This company several months ago purchased the 2,500-bbl. plant of the Alamo Refining Co. at Isom. This capacity has been increased so that it can now skim 8,000 bbls. a day. The company has large crude oil production in the Panhandle area and for that reason it is assumed its present refinery operations will be maintained indefinitely. The Panhandle area now has four plants in operations with combined crude oil runs to stills of 16,400 bbls. daily. A fifth plant is now being built by Reese Allen and associates in the Gray County Field.

In the West Texas area no new plants started operation during the past month. However, by June it is expected that the new skimming plants of the Wickett Refining Co. at Wickett and the Tonkawa Petroleum Co. plant at Pyote will be in operation. In addition the Humble Oil & Refining Co. has an enlargement program under way at its McCamey plant, the largest in the field. The program calls for a plant which will be able to skim at least 25,000 bbls. of crude oil daily.

In the Wichita Falls area the Primrose Refining Co. is starting up its 1,500-bbl. skimming plant after a shut down of a year. The company expects to operate the plant at capacity.

North Louisiana-Arkansas

North Louisiana has its fifth refinery in the Superior (near Shreveport) plant of the Dixie Oil Co. The latter company is a subsidiary of the Standard Oil Co. of Indiana and in the past its operations have been confined to the production end.

The plant which the Dixie company is now operating formerly belonged to the Superior Refining Co. It has been shut down for several years. The present owners have remodeled the plant and it will be operated by men trained in the Standard of Indiana refinery organization. It is understood that the Indiana Standard will aid in marketing the plant's output. The starting up of this plant coupled with increases in plants already operating accounts for a 6,500-bbl. increase in the North Louisiana area.

In Arkansas several of the plants added to their crude throughput so that the increase for the State totals 2,750 bbls.

MID-CONTINENT REFINERY OPERATIONS

TABLE NO. 1

(Based on operations May 1, 1928, and April 1, 1928)

	*No. of Plants May 1	Crude Cap'y. Bbls.	Crack. Cap'y. Bbls.	Plants Oper'g. May 1	Runs to Stills May 1	Plants Oper'g. April 1	Runs to Stills April 1	Daily Inc. May 1
Oklahoma	45	275,200	103,550	41	192,425	40	192,225	200
N. C. Texas	45	195,000	25,200	37	120,450	36	107,050	13,400
Kansas‡	18	134,000	68,800	15	94,400	15	90,250	4,150
N. Louisiana	5	55,000	16,800	5	48,500	4	42,000	6,500
Arkansas	9	33,300	9,700	7	23,450	7	19,700	3,750
Total	122	692,500	224,050	105	479,225	102	451,225	28,000

*Does not include plants shut down one year or more. ‡Includes one Missouri plant.

TABLE NO. 2

(Based on operations May 1, 1928, and May 1, 1927)

	Plants Oper'g. May 1, 1927	Runs to Stills May 1, 1927	Daily Inc. May 1, 1928
Oklahoma	42	177,335	15,090
N. C. Texas	33	90,050	30,400
Kansas*	16	82,600	11,800
N. Louisiana	4	39,810	8,690
Arkansas	7	17,560	5,890
Total	102	407,355	71,870

*Includes one Missouri plant.

REFINERY OPERATIONS IN KANSAS

(Plants which have been in operation during the past year)

Name and Location—	Daily Capacity	Runs May 1	Runs Apr. 1
Barnsdall Refineries, Inc., Wichita	4,000	4,000	4,500
Derby Oil Co., Wichita	6,000	3,500	3,500
Derby Oil Co., Russell	2,500	(*)	(*)
Eldorado Refining Co., Eldorado	3,500	2,700	2,000
Golden Rule Refining Co., Wichita	1,500	700	700
Kanotex Refining Co., Arkansas City	10,000	6,000	4,000
Manhattan Oil Co., Kansas City	6,000	4,500	4,500
Miller Petroleum Co., Humboldt	2,000	(*)	(*)
National Refining Co., Coffeyville	6,500	6,000	6,000
Peerless Oil Refining Co., Chanute	3,000	2,200	2,000
Roxana Petroleum Corp., Arkansas City	20,000	18,000	17,000
Sinclair Refining Co., Coffeyville	10,000	10,000	9,500
Sinclair Refining Co., Argentine	9,500	8,500	8,000
Skelly Oil Co., Eldorado	23,000	11,200	12,000
Standard Oil Co. of Kansas, Neodesha	12,000	8,500	8,000
Vickers Petroleum Co., Potwin	3,500	2,000	1,900
White Eagle Oil & Refining Co., Augusta	10,000	6,600	6,600
West Missouri Group—			
Wilhoit Refining Co., Joplin	1,000	(*)	(*)
Total	134,000	94,400	90,250

*Shut down.

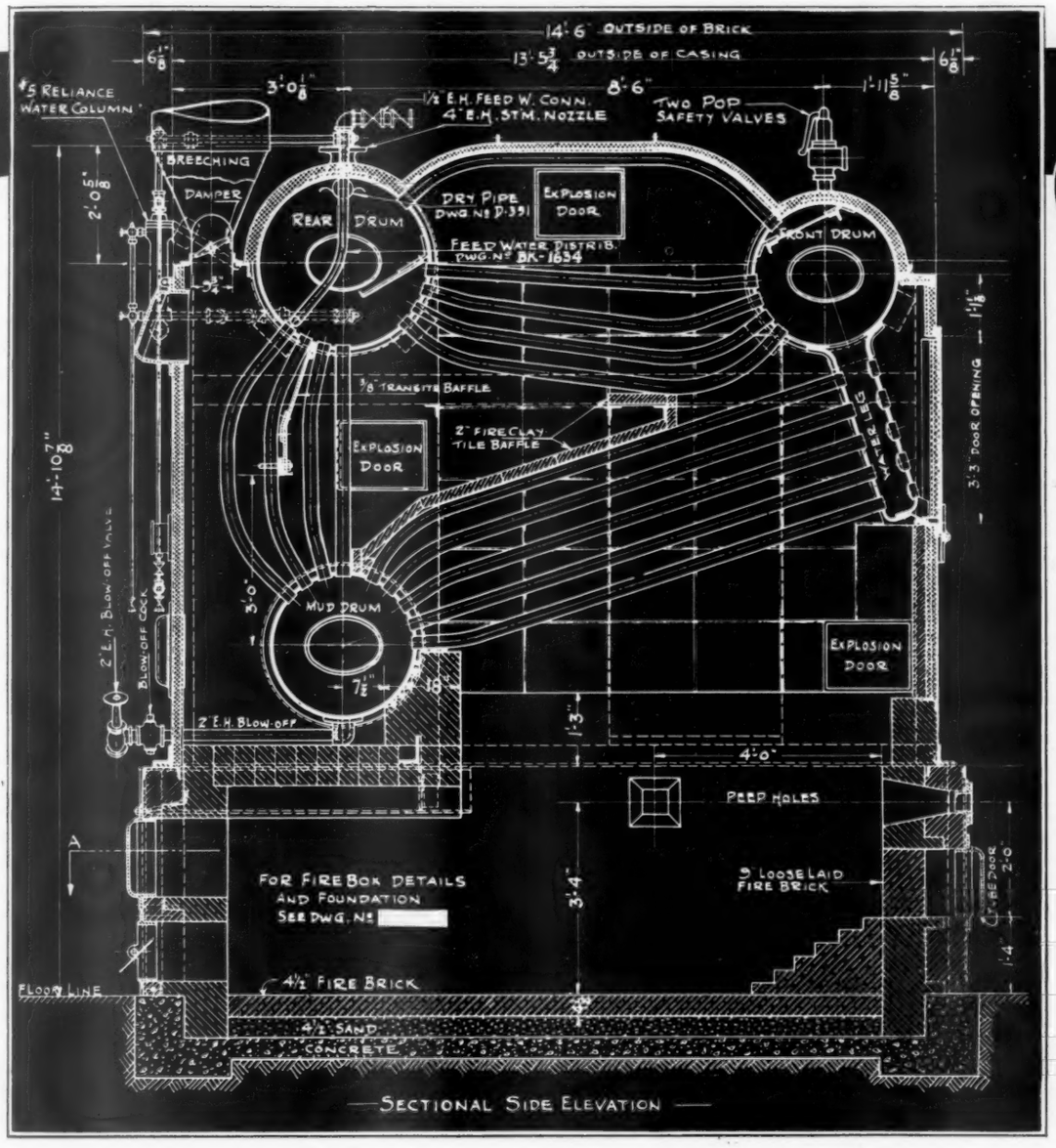
REFINERY OPERATIONS IN OKLAHOMA

(Plants which have been in operation during the past year)

Name and Location—	Daily Capacity	Runs May 1	Runs Apr. 1
Anderson-Prichard Oil Corp., Cyril	2,500	2,000	1,900
Barnsdall Refineries, Inc., Barnsdall	6,000	4,000	4,000
Barnsdall Refineries, Inc., Okmulgee	10,000	4,000	5,000
Bell Oil & Gas Co., Grandfield	4,500	2,000	2,100
Bolene Refining Co., Enid	5,000	2,500	2,500
Canfield Refining Co., Yale	400	75	75
Champlin Refining Co., Enid	16,000	9,500	9,500
Continental Oil Co., Sapulpa	10,000	2,500	1,200
Cushing Refining & Gasoline Co., Blackwell	1,500	1,800	1,500
Cushing Refining & Gasoline Co., Cushing	3,500	2,200	2,000
Empire Oil & Refining Co., Cushing	5,000	4,700	4,700
Empire Oil & Refining Co., Okmulgee	4,000	4,000	4,000
Empire Oil & Refining Co., Ponca City	7,500	7,500	7,500
Garber Refineries, Inc., Garber	3,500	3,300	3,000
Globe Oil & Refining Co., Blackwell	7,500	5,000	5,000
Illinois Oil Co., Cushing	3,000	2,200	2,200
Imperial Refining Co., Ardmore	5,000	(*)	(*)
Independent Oil & Gas Co., Okmulgee	5,000	3,300	3,500
Interocean Refining Co., Bristow	4,000	(*)	(*)
Johnson Oil Refining Co., Cleveland	6,000	5,500	5,000
Marland Refining Co., Ponca City	30,000	25,000	30,000
Mid-Continent Petroleum Corp., West Tulsa	40,000	25,000	25,000
Oil State Refining Co., Allen	800	600	600
Peppers Gasoline Co., Covington	1,000	700	800
Pierce Oil Corp., Sand Springs	8,000	7,000	7,000
Producers Oil Co., Bristow	2,500	800	900
Producers & Refiners Corp., West Tulsa	6,000	4,000	3,500
Pure Oil Co., Ardmore	5,000	2,000	(*)
Pure Oil Co., Muskogee	9,000	7,000	7,000
Riley Petroleum Co., Bristow	1,000	(*)	100
Rock Island Refining Co., Beckett	2,500	1,800	1,600
Sayre Oil & Refining Co., Sayre	500	(*)	(*)
Shaffer Oil & Refining Co., Cushing	10,000	10,000	10,000
Sun Oil Co., Yale	5,000	5,000	4,900
Sinclair Refining Co., Muskogee	1,000	750	700
The Texas Company, West Tulsa	12,000	12,000	12,000
Texas Pacific Coal & Oil Co., Wynnewood	2,500	2,000	(*)
Tidal Refining Co., Drumright	10,000	10,000	9,500
Transcontinental Oil Co., Boynton	2,500	2,000	2,000
Transcontinental Oil Co., Bristow	5,000	3,500	4,000
Tonkawa Petroleum Co., Tonkawa	2,500	650	650
Western Oil Corp., Beckett	2,000	1,000	1,000
White Oak Refining Co., Allen	2,000	2,000	2,100
Wirt Franklin Petroleum Corp., Ardmore	4,000	2,600	3,200
Yale Oil Corp., Yale	1,500	1,000	1,000
Total	275,200	192,425	193,325

*Shut down.

(Continued on Page 197)



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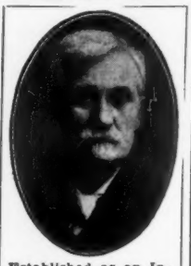

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THE PRESENT OUTLOOK FOR OIL

The recent upward movement of oil securities in the stock market has provoked more or less widespread comment. Leading petroleum issues within two weeks have recorded gains ranging as high as twenty-five per cent.

To judge by the present attitude of Wall Street it would be supposed that the oil industry is on the verge of a period of phenomenal prosperity. But out in the regions where oil is produced and refined there has been a more moderate opinion, tempered by the experience of the past year and a half which has been an impressive warning against overdoing optimism.

Nevertheless, within the past few weeks there has been a little better feeling within the industry. There has been a noticeable improvement in the situation due to the progress with proration and a greater readiness to believe that, while not a panacea for all the industry's troubles, it is a distinct drift in the right direction.

Then in the matter of consumption many feel there is a good chance of more than the normal increase owing to the increased number of new cars being manufactured and sold this year compared to last year. Against this there is, of course, the possible handicap of weather but with so much unseasonable weather behind us the theory of averages encourages the hope that the summer and fall will bring compensation.

So while it is a conservative conclusion that things are a long way from being as good as they look through the glasses from Wall Street, conversely the situation is not nearly so bad as it may sometimes appear to the oil men who have suffered losses during the past 18 months.

The great difference between conditions today and conditions a year ago is that the industry is now in control of its operations.

This month a year ago the tidal wave of Seminole was threatening to engulf us with no apparent prospect of being able to check it. The suggestion made through The Oil and Gas Journal that an effort be made to get the producers to come together on some form of agreement to curtail the overproduction seemed visionary to many who pronounced it impracticable because operators could never be got to co-operate and because if they did the Government, federal or state, would protest or prosecute.

The answer in these columns was that the Government, demanding conservation through the Oil Board, could not consistently oppose or obstruct the industry in taking the only possible steps for conservation through co-operative action. Further, that the Government's insistence upon conservation very plainly warned the industry that if oil men failed to solve the problem the Government would step in and take control of their business.

That view prevailed and with the approval of the Federal Oil Board the initial conference was held at Washington which led to the New York and Tulsa meetings and the eventual formulation and application of the Seminole agreement as ratified by the State Corporation Commission of Oklahoma.

Even then there were many doubters who still clung to the conviction bred of long experience in the former habits of the industry that the plan never could be worked out to a satisfactory conclusion. Discussion at times became heated and infinite tact was required but, as the time passed and one difficulty after another was smoothed out, confidence in the workability of the plan grew and with it the belief that the extension of co-operation offered the only hope of restoring the industry to its balance.

There have been times when differences of opinion over details deemed vital seemed likely to overthrow the barriers so carefully erected and let in the full tide of overproduction but each time this belief that co-operation was the protection of all prevailed.

The actual demonstration of what it could accomplish at Seminole in the face of initial disbelief and developing difficulties silently but surely won recognition and acceptance. The hope that the experiment at Seminole would lead to wider adoption was fully justified.

Proration in Pecos County, Texas, was much more easily effected because of the spreading sentiment for co-operation. The shut-in movement in California, where producers early foresaw the necessity for co-operation for self protection, was assisted by the developments in Oklahoma and Texas. The need for prompt action in Winkler County, Texas, to avoid the handicaps from initial delay as at Seminole, was generally recognized and the preliminaries were well in hand when the State Railroad Commission acted.

Meanwhile the idea was gaining ground in the Mid-Continent leading to the plan for supervision of wildcat areas which is being supported in Kansas and in the North Louisiana and Arkansas districts as well as in Oklahoma and Texas.

The Federal Oil Board's citation of Salt Creek operations as an example of the advantages and value of orderly development and production has been followed by co-operative drilling on pooled acreage where producers agree upon a common test.

The most recent example of the salutary effects of the campaign for co-operation in conservation is the movement for control of operations in Howard County, Texas. In fact, so general has the present acceptance of this policy become that it is the first thought as soon as a threatening area is discovered.

The complete reversal of the sentiment of the industry within one short year is nothing less than marvelous but only illustrates again the rapidity with which oil men will discard traditional habits when shown something better.

Today the industry's confidence in the oil situation is based largely upon the assurance that co-operation for conservation will control production. As each menacing area is brought under agreement the outlook improves. That is the view in the oil country and it is reflected and endorsed in Wall Street which uses it as the basis for the buying movement in oil issues. The stock market likes to claim prescience in anticipating industrial and commercal developments. Occasionally it goes too fast and too far ahead while the men actually engaged in industrial operations are working their way out. That is the difference between speculation and business, but in this instance the distinction is one of degree rather than trend.

The informed and impartial observer of existing conditions in the oil industry may safely conclude that while the improvement in the outlook may not be as great as the stock market infers the fact that the industry, for the first time in its history, is uniting in undertaking with official assistance to stabilize its supply must have a beneficial effect all around.

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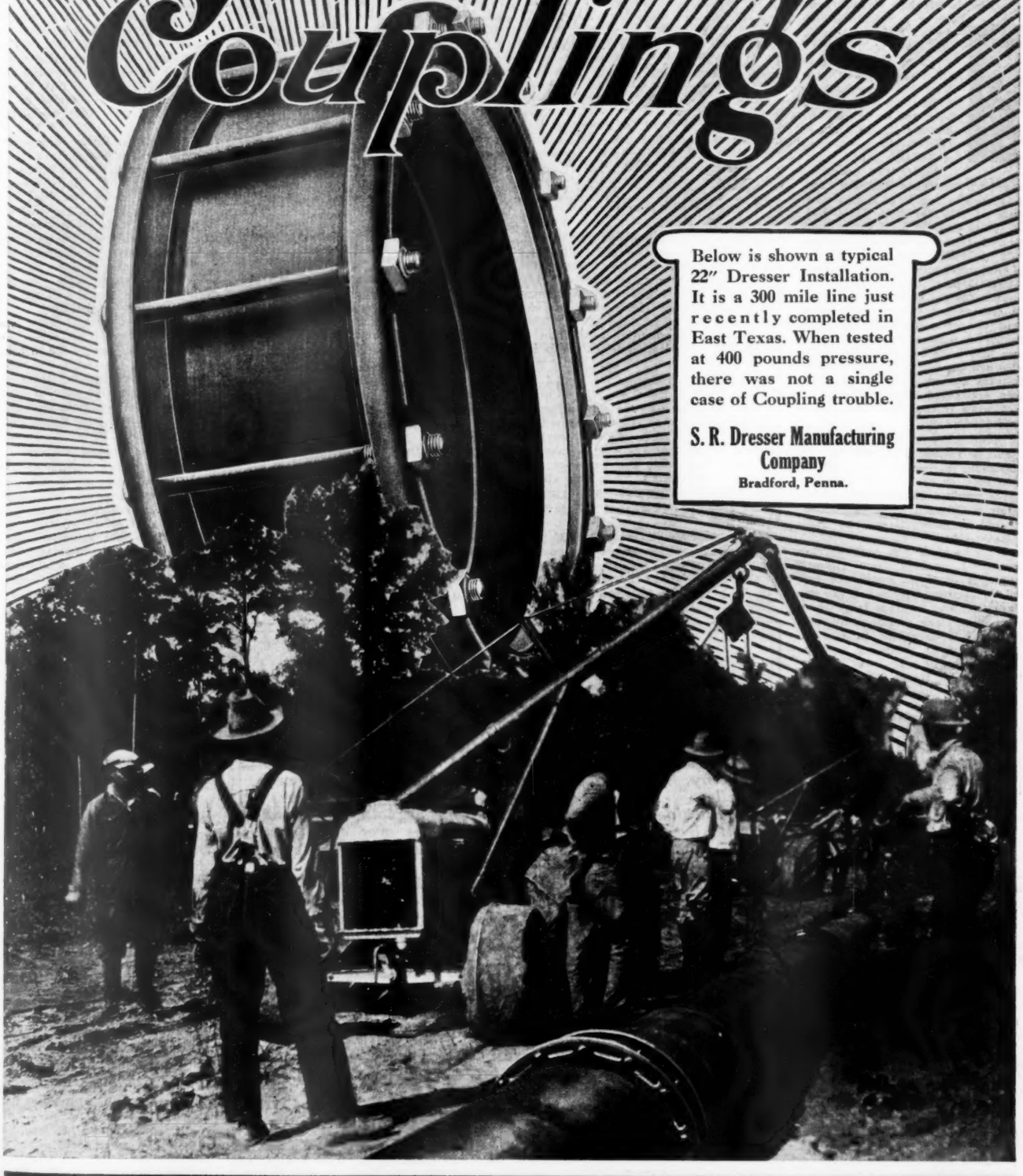

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DOMINATE

May Amend Hendricks Proration Basis

Maximum Production May Be Raised to 180,000 Bbls. to Let Pool Produce 150,000 Bbls. Daily. Ironing Out Difficulties

By James H. Dameron
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., May 7.—The Hendricks Pool in Winkler County went under a restriction order at 7 a. m. May 5, that brought the field's soaring production to an abrupt halt. On May 4 the pool's production was 320,000 bbls. and on the following day it was down to 175,000 bbls. — a drop of 145,000 bbls.

Under the proration order issued by the Texas Railroad Commission Hendricks can have a maximum production of 150,000 bbls. However, when the units and the well percentages were figured the pool had an allowed production of 147,839 bbls. or 2,161 bbls. short of its maximum allowed production of 150,000 bbls.

The reason for the shortage is because two and one-quarter 40-acre units were figured in as producing units but are not actually on production. These units are leases that have bad holes on them. The wells are producing a few barrels daily but are not on actual production. The holes are being reconditioned and until that work is complete those units will be off production.

In all probability the railroad commission will be requested to raise the allowed maximum production from 150,000 to 180,000 bbls. or upwards in order to let the pool produce 150,000 bbls. daily. Raising the maximum allowed production will not send the production of the pool above 150,000 bbls.

There are several 40-acre units in the pool that can't produce their allowed quota. Owners of those leases are not permitted to recover the loss from another lease that can produce more than its prorata share. The maximum allowed production will be increased to a point where the method of prorating production of each well will permit the pool to make 150,000 bbls., if the railroad commission will grant the request operators will make.

Umpire Harold N. Pardee and his staff worked day and night all week before the proration order went into effect to have allowed production figures ready for each lease owner at 7 a. m. Saturday.

While the figures are not satisfactory to all producers, the plan generally is conceded to be so for the present. Many details in connection with the proration of the pool are yet to be ironed out and it will probably be a few weeks before the pool will be under a smooth proration plan. In the end the plan may not be entirely satisfactory to everyone concerned but most operators feel the plan is the best under the circumstances and expressed the opinion they would adhere to it without a contest.

Wells and Units in Plan

The accompanying table gives the number of wells and units figured in the proration plan. It also gives the allowed production and potential production by companies. The potential production of 164 wells was figured to be 521,601 bbls. and the actual production on May 4 totaled 320,000 bbls. or approximately 200,000 bbls under the potential.

When the pool reached its peak of 320,000 bbls. there were several of the big wells still producing under their estimated potential and were producing under restricted conditions.

Cranfill & Reynolds' gusher, No. 1-C Hendricks, Section 33, Block 26, which opened up the northern extension of the pool, easily holds the big well record in the pool. Its potential capacity was figured to be 60,000 bbls. daily when the separators were thrown out by the well. New separators are being installed and a new gauge will be taken. That company's allowed production figured 14.235 bbls. daily from 1¼ units. The potential production on the gusher sent up Cranfill & Reynolds' production. That company has a potential production of 90,755 bbls., the largest potential in the pool.

Operator—	Wells	Units	Production— Allowable	Potential
Southern & Dixie	27	15	21,362	49,549
Roxana Petroleum Corp.	20	8	18,321	74,623
Independent Oil & Gas Co.	15	6½	8,151	13,799
Marland Oil Co.	1	¾	1,335	4,320
Pure Oil Co.	10	3	13,466	40,843
Gulf Production Co.	11	6	10,070	30,437
Cranfill & Reynolds	6	1¼	14,235	90,755
Texon Oil & Land Co.	4	2	3,439	10,716
Indreth Corp.	8	4	5,555	12,235
Magnolia Petroleum Co.	6	2	2,310	2,866
California Co.	8	2	2,746	5,897
Murchison & Cranfill	5	2¼	2,266	903
Atlantic Oil & Production Co.	17	7	13,934	50,705
Atlantic-Collett	3	2	11,110	64,063
Republic Production Co.	4	3	5,403	17,779
Humble Oil & Refining Co.	17	7	14,136	62,111
Total	164	76¾	147,839	521,601

Proration was figured on a basis of 79 units, 2¼ units of which are not shown in the table. The units are leases which have bad holes and are only producing a few barrels daily. The holes are being reconditioned.

Atlantic Oil Producing Co. and J. D. Collett's No. 2-F Hendricks, in the north part of the pool, was the second largest potential producer. It was figured to be a 53,103-bbl. well Those operators' allowed production also was cut sharply in comparison with the potential production of their leases. They were alloted two units with a potential production of 64,063 bbls. and are permitted to produce 11,110 bbls. daily.

Southern Crude Oil Purchasing Co. and Dixie Oil Co. will be allowed to produce almost half of those companies' potential because of the large number of units they have in production. They have 15 units and a potential production of 49,549 bbls., which gives those companies an allowed production of 21,362 bbls. Some of their units will not produce their allowed production, according to information from the field and consequently those companies will produce less than their prorata share until a revision is made.

May Be Amended

It is probable the railroad commission's order will be amended by the fifteenth of the month when the new percentages are again figured. Operators gave much credit to Mr. Pardee and J. D. Collett, chairman of the advisory committee, and their associates for whipping the program into shape and starting it on time.

Mr. Collett has called a meeting of the advisory committee for a session in Fort Worth Thursday. It is expected the railroad commission will be requested to raise the allowed production of the pool following the Thursday meeting.

By Thursday the advisory committee will have several days' gauges of the pool to guide it in making further recommendations. Mr. Collett expressed the opinion that after the figures are analyzed the needs of every operator will be cared for and thus eliminate possible contesting of the proration order.

On May 2 the railroad commission amended its original proration order by eliminating a part of Rule 2 which required pipe line companies to nominate the amount of oil they would take each 15 days.

Since the proration order went into effect several engineers have started raising their figures on the ultimate recovery of the pool. Many were of the opinion that the unrestricted flowing of numerous big wells in the pool would cut down the ultimate production as a result of coning conditions. The proration order is also expected to improve the water condition in the pool to the extent it will let the water table rise more uniformly than it would had the pool been left to produce unrestricted.

In the past several days operations have been started on several untested tracts. This is being done to bring many of the tracts that have not been drilled into production and get them producing under the proration plan. Consequently, drilling in the Hendricks Pool is expected to keep the same pace it has been following for the past three months.

Effect on Storage

What effect the proration order will have on the storage building program now being carried on in Hendricks and the anticipated program for the future remains to be seen. On May 1 there were 8,518,693 bbls. of Winkler crude in storage in that area. The total storage capacity at that time was 10,378,000 bbls., leaving more than 1,850,000 bbls. of storage available. At the same time in excess of 4,000,000 bbls. of tankage was being built in the Hendricks area.

Field storage was filled at the rate of 96,000 bbls. daily during April while 122,000 bbls. was shipped out in tank cars, run to local refineries and pumped out of the field through three pipe lines. Crude being pumped out of the field averaged 72,000 bbls daily but figures on what amount of this was moved to storage in other West Texas areas is not available at present.

Howard and Pecos

In the meantime proration plans for southern Howard County and the plans to put Yates under a railroad commission order are moving forward. Yates operators desire to have that field prorated under a railroad commission order rather than under the present plan. Southern Howard County operators, or at least the majority, want southern Howard County, which appears to be another West Texas threat, held back by a proration order.

As a result of the proration of Hendricks West Texas production should hover around 300,000 bbls. for several months. West Texas hit a new peak last week when it scored 406,000 bbls. That climb was the direct result of huge gains in Hendricks. The true result of proration in Hendricks probably will not be reflected in the coming week's estimate but by the middle of the month production estimates will reflect the true results.

Pecos no doubt will be held down under a proration order and Howard County is not expected to get out of control. While wildcats may open another Hendricks or Yates any day officials point out that wildcatting so far this year has not been very successful. Even though something new does break out operators are firm in the belief that restrictive measures will be adopted for any emergency.

HIGH SPOTS IN FIELD NEWS

New wells in Township 7-6, Seminole County, Oklahoma, definitely unite scattered pools with Little River. Effort is being made to curtail all Little River production.

Production of the Allen Pool in Township 5-8, Pontotoc County, Oklahoma, increased to 21,000 bbls. a day by new wells.

Rushing and others' well in Champagnolle deep sand area, Union County, Arkansas, averages over 4,400 bbls. daily the first five days. Serious water menace develops in deep horizon.

Group of deep wells completed in Long Beach, Calif., increases production of pool to 180,000 bbls. a day.

Winkler County, Texas, wells, permitted to flow openly for the purpose of determining proration, give county a new peak production of 321,810 bbls. a day. Production was then cut down to 175,000 bbls. on first day of curtailment period and to 143,695 bbls. on the second day.

A 3,000-bbl. well just north of the South Liberty Field in Liberty County, Texas (Coastal Fields), is the largest of the half-dozen wells thus far brought in in that extension.

Rig on deep well of Texon Oil & Land Co. in Reagan County, Texas, destroyed by fire. Well at depth of 8,220 feet, with a bailer in the hole.

Late Field News

KANSAS

An important development in the Gorham area of Russell County, Kansas, was the news that Stearns & Streeter's No. 2 Mermis, NW cor. NW SW, Section 33-13-15w, is now making 15 per cent water and swabbing 65 bbls. hourly from sand 3,306-3,310 feet. It was drilled 1 foot deeper and encountered the water.

OKLAHOMA

The Greater Seminole area produced

(Continued on Page 203)

Wildcatting Increase in Panhandle

Possible Third Sand Found in Fluhmann Pool, Wilbarger County. Thirteen Dry Holes in Young County

By James H. Dameron
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., May 7.—Wildcats and semiwildcats furnished the most interesting developments in the Wichita Falls, Panhandle and Ranger districts during the past week with the Ranger district holding the principal interest.

Production of the three districts showed a general decline and their combined production was down 1,251 bbls. in comparison with the previous week's report. Panhandle had the greatest decline when all counties in that area showed a general decline and were off 1,025 bbls. in the aggregate. Wichita Falls district slipped 163 bbls. in daily average while the Ranger district showed only a 63-bbl. decrease.

The best completion in the Panhandle was in semiwildcat territory when Danciger Oil & Refining Co. shot its No. 1 Crank, SW NW, Section 163, Block 3, with 100 and 160 quarts and the well swabbed 200 bbls. of 43.8 gravity crude the first 12 hours. This well has production on three sides of it and is in semiwildcat territory east of the Noe-McConnell area in Carson and northwestern Gray Counties.

East of Pampa

East of Pampa, Donley Gray Oil Co.'s No. 1 Gordon, Section 79, Block 3, was a dry hole at 4,155 feet. In the territory east of LeFors, where The Texas Company opened production several months ago, that company seems to be getting a good well in its No. 1 M. B. Davis, SE NE, Section 3, Block 1, A.C. H.&B. Survey. The well is spraying 150 bbls. daily from granite wash at 2,715-20 feet but completion is being delayed until a bit can be fished out.

In the area opened by Ray and Massie in Section 51, Block 25, Gray County, Plains Drilling Co. and Ray's No. 1-A Chapman was a failure at 2,933 feet. Further east in the territory where McCauley recently completed a fairly good well, Sullivan and associates' No. 1 S. A. Cobb, NE cor. NW, Section 64, Block 25, was a disappointment. The well sprayed a little oil when it encountered gas at 2,510 feet. The gas increased to 15,000,000 feet when the bit reached 2,522 feet and no more increases were encountered down to 2,550 feet where drilling was stopped. The well was completed as a gas well.

The only other county aside from Gray County, reporting a completion was Wheeler County where a 35,000,000-foot gas well was completed. Rood and associates are drilling an interesting test in that county in their No. 1 S. H. McDonald, SE NW SW, of the J. N. Lindsay Survey. The well topped the lime at 3,040 feet and is drilling at 3,810 feet without anything showing.

Wildcatting continues to show an increase in the Panhandle. Six new locations were reported over the week-end, and all were in Gray County. They are given in the wildcat drilling report. Three wells were started up in Hartley County by the Amarillo Oil Co. They are the only drilling wells in the county.

Third Zone in Fluhmann Pool?

Roxana Petroleum Corp.'s No. 2 T. J. Milner, Section 31, Block 9, H.&T.C. Survey, in the Fluhmann Pool, Wilbarger County, is one of the most interesting wells in the Wichita Falls district. A sand at 2,119 feet was encountered in this well and it had a showing of oil. If it is found to be productive it will be the third producing zone in that pool. Casing has been cemented and the well is expected to be drilled in within a few days. This sand is the deepest thus far encountered in the Fluhmann Pool. Production is coming from two zones in that pool, the 1,400-foot sand and the 1,800-foot sand.

A review of the Wichita Falls area reveals the completion of a number of good producers and a flock of shallow wildcat failures in Young County. Drilling showed a slight increase and close to 60 new locations were reported.

Archer County reported only a handful of completions, most of which were from the Gohlke Pool which is practically drilled up. One of the Archer County completions was good for 165 bbls. Completions from Clay, Collins, Cooke, Grayson and Knox Counties were all dusters.

The southeast part of Wilbarger County is the most active and drilling there shows no signs of abatement. Fain-McGaha Oil Corp. completed a pair of good wells, the best good for 110 bbls.

Thirteen more dry hole symbols were dotted on Young County maps during the week. The wildcatting for the shallow pay in that sector continues brisk and as fast as holes are completed their numerical strength is offset by a flock of new locations being reported. The Loving shallow pool reported half a dozen new wells in its borders. The best of the completions was Riggs and associates' No. 6 McKinley which made 400 bbls. initially when put on the pump from sand at 581-96 feet. The remaining wells completed last week were 25-bbl. or smaller producers.

Brown and Coleman Busy

In the Ranger district, Brown and Coleman were both prominent in counties reporting active spot news. Cranfill & Reynolds' No. 1-A Keller, a 100-bbl. well at a total depth of 1,206 feet was the only completion in the Eubanks Pool southwest of Cross Cut. Interest in this pool is centered around the surveys being made of the various leases. Survey lines were questioned soon after the pool was opened by Cranfill & Reynolds. Those operators' leases are believed to be correctly surveyed and they are proceeding with their drilling. Two others, however, have shut down their wells pending the completion of the checking of survey lines. Cranfill & Reynolds purchased additional acreage in the immediate vicinity of their discovery tract. They purchased the northwest 40 acres of the Eubanks farm and a small strip containing a fraction over 10 acres a quarter of a mile south of their No. 2 Eubanks. It is reported the acreage was turned for $110 per acre.

Tannehill Pool

Four new wells were added to the Tannehill Pool north of Albany. E. M. Treat Oil & Gas Co.'s No. 3 Matthews was the best completion in the group when it came in making 240 bbls. from 1,167½ feet. This pool has fallen below expectations. Operators at first believed it would be a rival to the Cooke Ranch Pool but one 800 bbl. well has been the best completion this far. It was discovered early in March and now has 12 wells producing around 1,400 bbls. daily.

Interest in Coleman County switched to the Continental Oil Co.'s No. 1-F Overall in the R. H. Overall Survey No. 66, which is making 30 bbls. per hour from sand at 1,503-05 feet. The well had 6,000,000 feet of gas at 1,492-1,503 feet. The 720-bbl. well is located 1,560 feet from the east line and 990 feet from the south line of the Overall Survey.

Showings in Coleman County in recent weeks has revived wildcat interest in that county and as a result acreage is changing hands more rapidly. Several tests scattered through the county are scheduled to be started within the next few weeks.

NORTH TEXAS
Estimated Daily Average Production for the Week Ending May 5

Panhandle—	
Carson County	7,285
Gray County	18,885
Hutchison County	41,280
Moore County	135
Potter County	25
Wheeler County	980
Total this week	68,590
Total last week	69,615
Decrease	1,025
Wichita Falls District—	
Archer County	22,897
Baylor County	80
Clay County	526
Cooke County	3,136
Jack County	1,458
Montague County	8,995
Throckmorton County	1,022
Wichita County	28,005
Wilbarger County	12,941
Young County	7,950
Total this week	87,010
Total last week	87,173
Decrease	163
Ranger District—	
Brown County	12,986
Callahan County	3,717
Coleman County	1,662
Comanche County	1,260
Palo Pinto County	460
Ranger	7,875
Shackelford County	9,483
Stephens County	8,370
Total this week	45,813
Total last week	45,876
Decrease	63
Grand total this week	201,413
Grand total last week	202,664
Increase	1,251

WILDCAT OPERATIONS IN TEXAS PANHANDLE

Week Ending May 5, 1928

Company, Well, Farm, Name, Section and Block—	Remarks—
BRISCOE COUNTY	
C. S. Rice's No. 1 J. C. Anderson, SE cor. NW NW, Sec. 22, Blk. B-3, B.S.&F. Sur.	S.D., 1,620 ft.
CARSON COUNTY	
Amarillo Oil Co.'s No. 1 E. S. Polling, C NE of N 80 acres of NE, Sec. 13, Blk. Y-3, B.&B. Sur.	Drlg., 2,690 ft.
Amatex Dev. Co.'s No. 1 E. S. Polling, Sec. 23, Blk. 3-Y, Denson et als' No. 1 W. E. Cobb, 930 ft. from N line, 380 ft. from E line, W half NW, Sec. 184, Blk. 3, I.&G.N. Sur.	T.A., 2,110 ft. Spudding.
Empire G. & F. Co.'s No. 1 J. C. Noel, C SW, Sec. 41, Blk. 4, I.&G.N. Sur.	Set 8-in. csg., 2,157 ft.
Empire G. & F. Co.'s No. 1 E. W. Sheridan, C NE, Sec. 242, Blk. B-2, H.&G.N. Sur.	24,000,000 ft. gas 2,651-76 ft; drlg. 2,845 ft.
Gulf Prod. Co.'s No. 1 W. R. Cobb, SE cor. S half NE, Sec. 202, Blk. 3, I.&G.N. Sur.	Drlg., 2,450 ft.
Marston Oil Co.'s No. 1 J. L. Noel	S.D., 3,191 ft; 1,000 ft. oil in hole from lime and G.W., 3,189-91 ft.
Skelly Oil Co.'s No. 8 H. Schafer, NE SW SW, Sec. 88, Blk. 4, I.&G.N. Sur.	T.P., 3,184-92 ft. in lime; G.W., 3,197-3,200 ft; T.D., 3,250 ft; averaged 64 bbls. per day.
CASTRO COUNTY	
Colorado O. & R. Co.'s No. 1 M. Simmons, SW cor. Sec. 73, Blk. M-17, B.S.&F. Sur.	Rig blown down.
Mystery Oil Co.'s No. 1 J. I. Crum, SE cor. NE, Sec. 333, Blk. M-6, S.K.&K. Sur.	S.D., 510 ft. for sag.
CHILDRESS COUNTY	
C. L. Sloane et als' No. 1 B. P. Smith, Sur. 49, F. P. Knott lands	Set 6-in., 2,902 ft; S.D., 4,005 ft.
COTTLE COUNTY	
Explin. Co.'s No. 1 Richards	Spudded and S.D.
Explin. Co.'s No. 4 Matador Land & Cattle Co., C, Sec. 46, J. H. Stephens Sur.	Rig on ground.
DALLAM COUNTY	
Marland Oil Co.'s No. 1 A. M. James, C SW W half, Sec. 31, S. H. McElreath Sur.	500 ft. wtr. in hole; drlg. lime, 4,130 ft.
Marland Oil Co. et als' No. 1 Capitol Synd., Sec. 36, Blk. 18, Capitol Synd. land	S.D., 3,500 ft.
DONLEY COUNTY	
A. T. Drlg. Co.'s No. 1 F. E. Harrington, Sec. 39, Blk. 3-C	1,300 ft. wtr., 3,115-32 ft; show gas, 3,140-60 ft; dry G.W., 3,-200-93 ft; cmt. 8-in., 3,510 ft; cmtng. off cave, 3,610 ft.
Martin & Watson's No. 1 W. J. Ball, Sec. 32, Blk. B, D.&P.R.R. Sur.	Cellar.
FLOYD COUNTY	
Explin. Co.'s No. 1 S. H. Boone, C. C. H. Johnson Sur.	U.R., 15-in. csg.
Explin. Co.'s No. 1 Land & Cattle Co.	S.D., 2,225 ft.
Hoffer Oil Corp.'s No. 1 Nelson	Spudded and S.D.
GRAY COUNTY	
Arnold & Howell's No. 1 Turneaux, C SW, Sec. 111, Blk. B-2	S.D., 759 ft.
Biggs et als' No. 1 Morse, SW cor. Sec. 3, Blk. 26, H. &G.N. Sur.	1,000,000 ft. gas, 2,158-94 ft; fish. bit, 2,220 ft.
Danciger O. & R. Co.'s No. 9 W. Jackson, NW cor. NE NW, Sec. 84, Blk. B-2	Junked hole, 2,880 ft; skidded 50 ft. N; stdzng., 2,915 ft.
Danciger et als' No. 1 R. Smith, SW cor. Sec. 143, Blk. 3	Location.

(Continued on Page 144)

PANHANDLE COMPLETIONS
Week ended May 5
Gray County

Danciger Oil & Refining Co.'s No. 1 W. Crank, SW NW Section 163, Block 3, I.&G.N. Survey, was shot with 100 quarts at 3,250 to 3,300 feet and 160 quarts at 3,180 to 3,250 feet and swabbed 200 bbls. of 43.8 gravity crude the first 12 hours. Total depth of the hole is 3,325 feet. Donley Gray Oil Co.'s No. 1 J. W. Gorden, Section 79, Block 3, was dry and abandoned at 4,155 feet. Plains Drilling Co. and Ray's No. 1-A Chapman was hole full of water at 2,933 feet and was plugged at that depth. Sullivan and associates' No. 1 S. A. Cobb, NE cor. NW Section 64, Block 25, was drilled to a total depth of 2,550 feet and completed as a 15,000,000-foot gas well from 2,510-22 feet. When the gas was encountered the well sprayed a little oil. The Texas Company's No. 1 J. E. Williams, NW cor. NE NW Section 7, Block 1, A.C.&B. Survey, made 59,000,000 feet of gas from 2,582-92 feet and was completed.

Wheeler County

Hatcher and associates' No. 3 fee, C SW SW Section 80, Block 23, H.&G.N. Survey, was completed as a gas well making 35,000,000 feet of gas from 1,470-87 feet.

WICHITA FALLS DISTRICT COMPLETIONS
Week ended May 5
Archer County

Barnsdall Oil Co.'s No. 5-A Wilson made 120 bbls. at 1,711-13 feet. C. P. Burton's No. 1 Parrish was dry and abandoned at 1,607 feet. R. I. Carter's No. 4-B Parkey was dry and abandoned at a depth of 1,717 feet. Fain & McGaha and United Production Co.'s No. 9-B Wilson made 65 bbls. at 1,570-72 feet. D. O. Johnson and others' No. 6-B Wilson made 165 bbls. at 1,559-69 feet. Petroleum Producers Co. and others' No. 4-E Wilson made 55 bbls. at a depth of 1,577-83½ feet, and No. 5-E made 40 bbls. at 1,566-72 feet.

The following wells were dry and abandoned: Shasta Oil Co.'s No. 1 Wilson at

(Continued on Page 200)

Hendricks Last Peak 321,810 Barrels

Extension of Roberts Pool, Howard County. Andrews County Wildcat Shows Sweet Gas. Fire at Deepest Well

By James H. Dameron
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., May 7.—Hendricks in Winkler County, with its varied developments during the week, was foremost in the field news, although an extension to the Roberts Pool in Howard, acreage trades and a wildcat in Andrews County showing sweet gas were also noteworthy.

Hendricks shot to a new peak of 321,810 bbls. for the 24-hour period ending at 7 a.m. May 5, and has probably shot its bolt so far as daily production peaks are concerned. The following 24 hours the pool's production was brought down to 175,625 bbls., as a result of the Railroad Commission proration order which went into effect the morning of May 5.

Proration may not be reflected greatly in the current week's production estimate. A few days of 300,000-bbl. production will be included in that estimate. But the following week will show the true results of the proration and will bring West Texas down to a daily production of 300,000 bbls. Last week it went to 406,000 bbls. daily as a result of the climb in Hendricks.

The following shows the production of the pool on its record-breaking day.

Company—	Number wells	Prod.
Atlantic O. F. Co.	19	74,575
California Co.	8	6,614
Cranfill & Reynolds	4	23,978
Gulf Prod. Co.	11	19,421
Humble O. & R. Co.	17	49,592
Independent O. & G.	15	11,676
Landreth Prod. Corp.	7	13,061
Magnolia Pet. Co.	6	2,189
Murchison & Cranfill	5	780
Pure Oil Co.	11	11,488
Republic Prod. Co.	4	14,756
Roxana Pet. Corp.	20	43,352
Southern Crude Co.	27	41,473
Texon O. & L. Co.	4	5,855
Totals	158	321,810

Approximately 30,000 bbls. of flush production was added to the pool's potential output last week from eight new wells. Many new wells are expected to be started in the near future to bring new units on production.

The north end of the pool proved to be one of the most interesting areas in the Hendricks area. Marland Oil Co. brought in a big well when its No. 3 Hendricks in Section 33 flowed 370 bbls. the first hour when it topped the pay at 2,759 feet. No water is showing. The well is shut in until additional storage is available. This well is the north offset to Cranfill & Reynolds' No. 2-C Hendricks, which started showing 6 per cent water last week. No. 2-C had the pay at 2,762 feet. It has been pinched down to 2,000 bbls. and is now making clean oil.

When No. 2-C started showing water it was feared the water would encroach rapidly in the other wells in the north part of the pool. No. 2-C is the east offset to the record well of the pool which was drilled by Cranfill & Reynolds. It was opened to estimate its potential capacity and before it reached its limit it blew up the separators. The well at present is estimated to be capable of making 60,000 bbls. daily. No water has shown in it. When the well first came in it showed less than one-half per cent b.s. and this showing has not increased.

Further on north, Murchison Oil Co. and Cranfill Brothers are expected to complete an outpost well within a few days. Their No. 1 Hendricks-H on a 5-acre tract in theNE of Section 33, is drilling below 2,700 feet in lime.

North of Hendricks Pool

Gibson & Johnson's No. 1 Daugherty, Section 3, Block 74, cored lime showing oil at 3,159-64 feet Monday. This well is north of the Hendricks Pool. It was reported that returns were being lost at 3,167 feet in a cavity and the test was shut down to make a test of the showing. Another important Winkler test is V. T. Bolin's No. 1 Brown, Section 4, Block B-5. Monday afternoon it was reported to have cored blue shale, red rock and anhydrite at 2,660 feet. This well is near the townsite of Kermit.

On further south and into New Mexico, Marland Oil Co.'s No. 1 Eaves, SW cor. SE Section 19-26s-37e, in Lea County, was again in the limelight. The well is estimated to be making 35,000,000 feet of gas and is drilling at 2,928 feet. It is approximately 4 miles north of the Gibson & Johnson test.

Tank car shipments out of Hendricks amounted to 1,670,678 bbls. during April, or at the rate of 55,689 bbls. daily. During the same period, 4,618 bbls. were run through refineries in the Hendricks area to give the total refining consumption for April, 158,567 bbls. Pipe lines moved 72,377 bbls. daily, or a total of 2,171,308 bbls. over the month, and at the same time 96,216 bbls. was being put in storage daily, or a total of 2,886,488 bbls.

Southern Crude Oil Purchasing Co. is reported to have made a contract with the Mexican Petroleum Co. for the delivery of 150,000 bbls. to Galveston. Southern Crude Co. is shipping around 10,000 bbls. to Galveston. Terms of the contract were not reported.

Gas Flow in Andrews County

Deep Rock Oil Co.'s No. 1 Harris, C SE Section 12, Block A-46, Andrews County, turned attention to that county Monday when the well started making a sweet gas flow that was variously estimated from 1,000,000 to 2,000,000 feet from sand and anhydrite at 2,940 feet. The gas blew the tools up in the hole and as a result a fishing job followed. Elevation of the Deep Rock well is 3,167 feet. The nearest dry hole to the test is the Maer & Staniforth No. 1 Taylor, C SE Section 15, Block A-42, and about 6 miles southeast. That well had an elevation of 3,215 feet and ran low. It was abandoned about a year ago at 4,206 feet.

In Runnels County, Watchorn Oil & Gas Co.'s No. 1 King in the George Dyer Survey No. 482 had a show of oil and is making around 5,000,000 feet of gas from 3,475-85 feet. Total depth of the hole is 3,501 feet. The well is 2½ miles southwest of production in Runnels.

Magnolia Petroleum Co. extended the Roberts Pool in southern Howard County, half a mile south into Glasscock County, when No. 3 Dora Roberts swabbed and flowed 72 bbls. per hour from the deep lime pay. The extension makes the deep pay pool 1 mile long and all of the wells drilled thus far in the pool have been along a north and south line. It is estimated this area is capable of making 125,000 bbls daily.

Howard Proration

An effort is being made to have the Railroad Commission hold Howard County down with a proration order and prevent it from becoming a market threat. It is reported that a few producers in Howard are not in accord with the plan to have it placed under a proration order and it is also rumored that independents are planning the construction of a line out of the field to the railroad about 65 miles north.

At present the Roberts Pool is being served by a 4-inch line owned by the Magnolia Pipe Line Co. Magnolia Petroleum Co. has its own wells shut in and is not taking the oil from any of the other deep lime producing leases.

Properties Purchased

One of the largest deals in West Texas history was completed last week when Warner-Quinlan Co. acquired three producing properties in the Church & Fields Pool in Crane County. The properties purchased were the Frank T. Pickrell 160 acres, Eastland Oil Co. 80 acres and the Church & Fields 80 acres. The deal involved approximately 7,000 bbls. of daily average production and around 2,000,000 bbls. of steel storage.

The purchase price of the three properties is reported to be upwards of $3,000,000. The firm of Cranfill Brothers, Dallas, Tex., as brokers, handled the deal.

Warner-Quinlan Co. is a complete unit with refineries at Warner, N. J. The Mexican Atlas Petroleum Co. and Cia del Agwi of Mexico are subsidiaries and furnish the refineries with crude. Those companies have a daily production of around 5,000 bbls. Warner-Quinlan Co. of Texas was organized to take over the operation of the newly acquired properties. J. C. McIntyre is president and manager with offices in the Magnolia Building at Dallas.

World Oil Co. made a purchase in Winkler County and plans to start a well in the near future that will be followed closely. That company is reported to have paid $350 an acre cash for the SW of the NE of Section 16, Block 26. Location has not been announced. The acreage is approximately 3 miles north of the field.

Fire at Deepest Well

The world's deepest well, Texon Oil & Land Co.'s No. 1-B University in the Big Lake Pool of Reagan County, is shut down at 8,220 feet as a result of a fire that destroyed the rig. Fire is believed to have been caused by a spark generated by friction of the sand reel brake. A bailer was lost in the hole. When the new derrick, which is being built, is completed the bailer will be fished out or drilled by and the hole carried down to a deeper depth.

Texon will use electricity to drill No. 1 University, NW cor. Section 11, Block 7, a wildcat in Reagan County. It will be the first wildcat test to be drilled with electric power.

WILDCAT OPERATIONS IN WEST TEXAS

Week ended May 5, 1928

ANDREWS COUNTY

Company, farm and location—	Remarks—
Deep Rock Oil Co.'s No. 1 J. W. Harris, C SE Sec. 12, Blk. A-46, Public School Land, elev. 3,167 ft.	Top salt 1,690 ft; drlg. 2,985 ft.

BORDEN COUNTY

Dixon Creek Oil Co.'s No. 1 Clayton & Johnson	Top salt 1,250 ft.; top lime 2,945 ft; drlg. 3,430 ft.
Marland Oil Co.'s No. 1 G. E. McDavid, C SW Sec. 156, Blk. 25, H.&T.C. Sur., elev. 2,310 ft.	Top salt 1,250 ft.; top lime 2,410 ft.; fishing tools 3,435 ft.
Marland Oil Co.'s No. 1 Alexander Murphy, C SW Sec. 66, Blk. 25, H.&T.C. Sur. (3,250-ft. test)	Location.

BREWSTER COUNTY

Cowden & Bowser's No. 1-A Jackson & Harmon, Sec. 1, Blk. 331, T.C.R.R. Sur.	Shut down 130 ft.
Forrest Oil Co.'s No. 1 Skinner, C SW SE Sec. 109, Blk. 2, G.C.&S.F.	Location.
J. M. Hickey's No. 1 Jackson & Harmon, NE cor. Sec. 182, Blk. 9, G.H.&S.A. Sur.	Shut down 1,079 ft.
Reese & White's No. 1 Kimbale, C NE Sec. 204, Blk. 9, G.H.&S.A. Sur.	Shut down 1,790 ft.
Van McMahil's No. 1 McIntyre, SE cor. Sec. 59, Blk. 352, 7 mi. S of Alpine	Shut down 1,700 ft.
Wilcox & Anderson's No. 1 Gage, Sec. 8, Blk. 300, T.C. R.R. Sur.	Shut down 2,100 ft.

COKE COUNTY

Lipan Oil Co.'s No. 1 S. M. Conner, Sec. 71, Blk. 2, H.& T.C. Sur.	Show oil 1,224-34 ft.; shut down 3,375 ft.
Lipan Oil Co.'s No. 1 E. C. Rawlings, Sec. 390, Blk. 1-A, H.&T.C., elev. 2,750 ft.	Shut down 2,739 ft.

CONCHO COUNTY

Douglas Oil Co.'s No. 1 A. Harrell, in John Moon Sur., No. 27	Spudding.
The Exploration Co.'s No. 1 Hartgrove, Blk. 240, J. Schouch Sur., elev. 1,718 ft.	Shut down 940 ft.
Sartain Oil Co.'s No. 1 Evridge	Spudded and shut down.

CRANE COUNTY

C. C. Duffey et al's No. 1 Cowden, Sec. 18, Blk. X, C.C.S.D.R.G.&N.G. Sur.	Building.
Gulf Prod. Co.'s No. 4 W. N. Waddell, C of SW SW Sec. 3, Blk. B-25	Drlg. 50 ft.
Gulf Prod. Co.'s No. 50 J. T. McElroy, Sec. 200, Blk. F, C.C.S.D.&R.G.N.G.R.R. Sur.	Drlg. 1,250 ft.
Gulf Prod. Co.'s No. 51 J. T. McElroy, 1,442 ft. S, 1,650 ft. W NE cor. of lease, out of Sec. 201, Blk. F, C.C.S.D.&R.G.N.G.R.R. Sur.	Rigging.
Humble O. & R. Co.'s No. 1 University-C, 330 ft. each way from SE cor. Sec. 40, Blk. 30, Univ. Land	Spudding 130 ft.

CROCKETT COUNTY

Anderson & Williams' No. 1 University, SE cor. NW NW SE Sec. 19, Blk. 47	Drlg. 1,942 ft.
V. T. Bolin & Co.'s No. 1 P. C. Coates, NW cor. SW Sec. 4, Blk. 2, I.&G.N. Sur.	Shut down 2,110 ft.
California Co.'s No. 1 Powell, Lease 1, SE cor. Sec. 62, Blk. BB, G.C.&S.F. Sur.	Building rig.
California Co.'s No. 2 L. P. Powell, Lease 1, 1,470 ft. W and 150 ft. N of SE cor. Sec. 72, Blk. BB, G.C.&S.F. Sur.	Location.
Dixie Oil Co.'s No. 1 George Thompson, Sec. 72, Blk. 1	Drlg. 330 ft.
Grayburg Oil Co.'s (formerly Osage Oil Co.'s) No. 1 Thompson-Collins, Sec. 70, Blk. 1, I.&G.N. Sur.	Drlg. 1,043 ft.
Grayburg Oil Co.'s No. 2 Thompson-Collins, Sec. 70, Blk. 1, I.&G.N. Sur.	Shut down 510 ft.
Grayburg Oil Co.'s No. 8 H. M. Halff, 660 ft. S of N L Sec. 70, Blk. 1, I.&G.N. Sur. (1,980 ft. E of their No. 2)	Drlg. 355 ft.
Gulf Prod. Co.'s No. 1 G. L. Thompson, 200 ft. S, 4,661 ft. E NW cor. Sec. 74, Blk. 1, I.&G.N. Sur.	Rigging.

(Continued on Page 137)

WEST TEXAS COMPLETIONS

Crockett County

R. B. Coyle's No. 1 H. M. Halff, center Lot 18, Section 70, Block 1, I.&G.N. Survey, had sulphur water at 1,378-82 feet and was abandoned.

Fisher County

Location was abandoned for Cranfill & Reynolds' No. 2 J. A. Young, Section 28, Block 1.

Glasscock County

Texon and Marland Production Co.'s

(Continued on Page 202)

Conditions in the oil industry are showing definite signs of improvement Every refiner will wish to be prepared to make the greatest possible profit–and the biggest profits are only possible through operation of Dubbs Cracking Process with Flashing System

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

Little River and Allen Feature Pools

Seminole Average Daily Production Increased 7,230 Bbls. by New Wells on Three-Day Open-Flow Tests

By J. L. Dwyer
Staff Correspondent, Oklahoma Fields

There were just two parts of the State which held the interest of the fraternity last week, the Little River Pool, with its southern extension, and the Allen Field of Pontotoc - Hughes - Seminole Counties.

The Little River Pool with the activity caused by the drilling of the 10 test wells, and the offset wells to the Snowden-McSweeney's No. 1 Tiger in Section 13-7-6, and the Independent Oil & Gas Co. and Highway Oil & Refining Co.'s No. 1 Harris in Section 23-7-6 has consistently held the spotlight. There were several completions among these wells last week, all of them being productive, and the output caused by the wells flowing the three days allotted to them under the Seminole agreement increased the average daily output of the Greater Seminole area for the week by 7.230 bbls. The field advanced to 283,000 bbls. a day, but the advance was temporary.

There is now a line running southwest and northeast for over 2 miles, and having a width of three-quarters of a mile, which has nothing within it to condemn the oil possibilities, and which may easily be expected to have a peak of at least 150,000 bbls. daily. While this oil will probably not be produced until early next fall, it could within a short time take up the decrease in output which the remainder of the field is experiencing.

The most important well to be completed was the Independent Oil & Gas Co. and Highway Oil & Refining Co.'s No. 5 Harris, SE cor. NW Section 23-7-6, which spread the limits of the outside region half a mile southeast, and which started flowing 140 bbls. hourly from the Wilcox sand, 4,190-95 feet. It is now making 2.590 bbls. daily at 5 feet into the sand, and will be pinched in.

The Allen Pool is the scene where 30 wells are now drilling, 22 on the north side of the river and 8 on the south side. The Mid-Continent Petroleum Corp. has contributed liberally to the development of this area by completing three wells on its Fleet lease in Section 7-5-8, where it now has 9,078 bbls. production daily. This amount represented the entire output of the pool two weeks ago.

Carter County

Simpson-Fell company has the rig up for No. 2 Winters, SW cor. SE SE, Section 19-1s-3w. The rig is also up for No. 5 May Walker, SE cor. SW NW, Section 10-4s-2w

Schermerhorn Oil Co. and others' No. 3 Crockett, SE cor. SW NW, Section 23-1s-3w, has been completed for 230 bbls. in sands at 2,330-2,613 feet, total depth 2,700 feet. Simpson-Fell's No. 4 May Walker, SE cor SW NW, Section 10-4s-2w, made 340 bbls. from sands at 2,106-2,196 feet.

Creek County

Dixie Oil Co. has the rig on the ground for No. 3 Tahkaney, NW cor. SE SE, Section 7-19-9. Devonian Oil Co. moved a machine out for No. 3 Unallotted. CNL S half SE NW, Section 4-18-12. Bryan & Emery erected the rig for No. 1 Fulsom, NW cor. SW, Section 8-16-11. The Prairie Oil & Gas Co. is moving the rig in for No 1 Thornburgh, NW cor. NE NE, Section 7-15-7. Stansbury & Young built the rig for No. 1-A Snyder, SW cor. NE NE NW, Section 34-15-10. Shaffer Oil & Refining Co. has the rig on the ground for No 3 Long, NW cor. NE NE, Section 6-14-9. C. O. Buckles' No. 2 Frailey, CWL NE SE, Section 22-18-8, is a machine spudding. C. H. Lebow's No. 1-A L. Tiger, SE cor. NW NW, Section 17-17-7, Drumright Pool, is a machine rigging up. Bu-Vi-Bar Petroleum Co. moved a machine out for No. 4-A B. Cain, NE cor. SE, Section 18-17-7.

Independent Oil & Gas Co.'s No. 1 Tahkaney, SW cor. NE SE, Section 7-19-9, has been completed for 30 bbls. after shooting 10 and 30 quarts in Wilcox sand at 2,885-2,910 feet. Kennedy & Horner's No. 1 Tiger, NE cor. NW NW, Section 25-18-11, an old well deepened, has been drilled to Turkey Mountain sand and abandoned at 2,472 feet. Dixie Drilling Co.'s No. 1-A Pahackney, NE cor. SE NW, Section 28-18-11, is dry and abandoned at 2,550 feet. Devonian Oil Co.'s No. 2 Unallotted, C SE NW, Section 4-18-12, has been completed for 5,000,000 feet of gas in Wilcox sand at 2,054 60 feet. Irelan and others' No. 1-A Baker, SW cor. Section 11-17-10, is dry and abandoned at 2,550 feet.

Henry & Avers' No. 3 Harris, CSL SE SE, Section 12-17-10, made 75 bbls from Red Fork sand at 1,884-1,908 feet. Pioneer Petroleum Co.'s No. 5-A Buckrot, NW cor. SW NE, Section 24-17-10, had Dutcher sand at 2,420-54 feet and made 25 bbls. Wilcox Oil & Gas Co.'s No. 3 Kimble & Reading, SE cor. NE NW, Section 18-14-10, Hall-Donnelly Pool, has been completed for 250 bbls. in Wilcox sand at 3,406-26 feet. Devonian Oil Co.'s No. 6 Bigpond, SW cor. NW SW, Section 36-15-7, was shot in sand at 2,558-2,600 feet and made 30 bbls. H. C. Wilson's No. 1 Durant, NW cor. NE, Section 10-15-8, has been abandoned at 3,233 feet. C. G. Tibbens Oil Co.'s No. 1 Tiger, SW cor. SE, Section 27-15-8, was completed for 7 bbls. in sand at 2,441-78 feet. The Prairie Oil & Gas Co.'s No. 16 Washington, NW cor. NW SE NE, Section 7-17-7, Drumright Pool, has been abandoned at 2,425 feet after plugging back from 3,244 feet.

Johnson County

Wirt Franklin Petroleum Corp. has built the rig for No. 1 Wilkes, SW cor. SE, Section 18-4s-4.

Kay County

McGraw & Burnham's No. 1 Alberty, C SE SE, Section 32-29-1, is spudding at 385 feet. Boucher and Marland Oil Co.'s No. 1 Woods, NE cor SE, Section 25-27-2w, is dry and abandoned at 3,680 feet. Martin and others' No 2 Buesing, C NW NW, Section 9-27-1, is dry and abandoned at 848 feet.

Osage County

C. F. Lake and others' No. 1, SE cor. NW, Section 32-24-8, is rigging up to deepen from 2,477 feet. Silurian Oil Co made location for No. 51, NW cor. SE NE, Section 18-23-12. R. L. Berlin's No. 11, SW cor. NW SW, Section 24-29-10, is dry and abandoned at 1,810 feet. Petroleum Drilling Co.'s No. 22, SE cor. NW SW, Section 25-26-8, made 10 bbls. from sand at 1,723-33 feet Silurian Oil Co.'s No. 2, NW cor. SE SE, Section 12-23-11, drilled to 1,600 feet and plugged back to 1,550 feet where it made a 10-bbl. well. Devonian Oil Co.'s No. 1, SW cor. SE NW, Section 27-21-10, is making 15 bbls. from sand at 1,865-1,923 feet.

Pawnee County

Washahoma Oil & Gas Co. made location for No. 1 Buffalo, SE cor. NE, Section 33-22-5. Fisher & Wallace's No. 3 Weeks, NE cor. SE, Section 30-20-9, was completed for 15 bbls. in Layton sand at 1,084-1,110 feet. Miller & Mooney's No. 1 Bush, NW cor Section 21-20-10, is dry and abandoned at 2,220 feet.

Payne County

Magnolia Petroleum Co.'s No. 2 Welker "B," SW cor. NE SW, Section 8-19-5, made 20 bbls. from sand at 3,050-67 feet after a shot of 60 quarts.

Tulsa County

Glidden Oil Corp. moved the rig out for No. 1-A Wray, CNL NW SW, Section 35-19-13. Posey Short has a machine on the location for No. 1-A Ismael, NE cor. SE, Section 13-18-12. Scott and others' machine is at the location for No. 1-A Billy, NE cor. SW, Section 33-17-14.

Glidden Oil Corp.'s No. 1 Wray, SW cor. NW, Section 35-19-13, is dry and abandoned at 2,056 feet. Sheridan Oil Co's No. 1-A Morton, SW cor. NW NW, Section 12-16-12, has been abandoned in Wilcox sand at 2,390-2,415 feet.

Beckham County

Magnolia Petroleum Co.'s No. 1 Martin, NW cor. NE NE, Section 28-9-23w, has been shut in for 70,000,000 feet of gas at 2,726 feet.

Caddo County

Abernathy & Ashton made location for No. 1 Smith, C NW, Section 15-12-11w.

Cotton County

Jenkins and others built the rig for No. 1 Record, NE cor. SW, Section 6-2s-10w.

Grady County

Magnolia Petroleum Co. has the rig up for No. 4 Heathley, CSL N half SW NE, Section 2-4-8w. Carter Oil Co. built the rig for No. 6 Horton, NE cor. NW NE, Section 8-3-5w. Carter Oil Co.'s No. 5 C. Kerans, NW cor NE SE, Section 21-3-5w, Carter-Knox Pool, is being cleaned out to deepen from 1,791 feet. Noble & Westerfelt's No. 5 Smith, NE cor. SE SW, Section 26-5-8w, cemented pipe at 2,040 feet, drilled to 2,440 feet and made 14,000,000 feet of gas.

Hughes County

Magnolia Petroleum Co. is building the rig for No. 1 Jetty, NW cor. NE SW, Section 21-7-8

Jefferson County

Sigler & McCall's No. 1 Peniston, NE cor. SE SW, Section 17-7s-5w, is estimated a 75-bbl. well in sand at 772-806 feet and preparing to pump. No. 2 Peniston, CSL N half S half S half, Section 17-7s-5w, is drilling at 248 feet.

Logan County

Roxana Petroleum Corp.'s No. 1 Stephens, SW cor. Section 29-19-4w, made an initial of 127 bbls. from Wilcox sand at 5,873-6,113 feet.

McIntosh County

Western Natural Gas Co.'s No. 1 D. Green, SW cor. SE, 17-11-17, has been abandoned at 660 feet.

Muskogee County

R. J. Keeney and others moved a machine to the location for No. 1 Grayson, SW cor. NW NW, Section 9-15-15. F. S. Duga and others' machine is at the location for No. 1 Harris, NW cor. SE, Section 19-15-19. P. H. Stein and others' No. 2 Cobb, NE cor. SE NW, is drilling at 65 feet. S Threlkeld has a machine at the location for No. 2 Cobb, SE cor. SW NW SW, Section 6-14-19, Muskogee Townsite Pool.

W. C. Newman's No. 1 Corbray, SE cor. Section 3-15-15, is dry and abandoned at 2,215 feet. J. M. Folts' No. 6 Taylor, CNL SE SE, Section 28-15-17, has been completed for 10 bbls. in sand at 1,934-2,090 feet. York Oil Co's No. 1 Jobe, NW cor. SE, Section 12-15-18, has been abandoned at 1,832 feet. D. L. T

WILDCAT OPERATIONS IN OKLAHOMA

NORTHERN OKLAHOMA

GRANT COUNTY

Otstot Development Co.'s No. 1 Snyder, NE cor. NE Sec. 6-28-3w ..... Shut down 4,518 ft.
J. V. Bailey and others' No. 1 Maddox, C SE Sec. 18-27-5w ..... Estimated 2,000,000 gas, spray oil 4,835-42 ft.; underreaming 4¼-inch casing.
Brasil & Moses' No. 1 Goutier, SW cor. NW Sec. 34-26-4w ..... Shut down for pipe 650 ft.
Lambert and others' No. 1 Tabor, SE cor. NE SE Sec. 23-26-3w ..... Abandoned after spudding.
Cowden and others' No. 2 Vollmer, CEL NE SW Sec. 22-25-4w ..... Fishing 5,640 ft.

HARPER COUNTY

Kopisch Oil Co.'s No. 1 Johnson, NE cor. SE Sec. 24-27-21w ..... Rigged up and shut down
Hoffer Oil's No. 1 Cooper, NW cor. SE SE Sec. 12-25-22w ..... Shut down 4,130 ft.

WOODS COUNTY

Victor Oil Co.'s No. 1 Buskirk, SW cor. SE Sec. 10-26-15w ..... Hole full water, 775-800 ft.; shut down 900 ft.
McCray Oil & Gas Co.'s No. 1 Whitney, NE cor. NW SE Sec. 19-24-14w ..... Shut down 1,880 ft.

KAY COUNTY

Boucher and others' No. 1 Cooper, SE cor. SE Sec. 25-27-2w ..... Drilling 3,680 ft.; show oil and hole full water.
Ponca Lee Oil's No. 1 McNeil, NW cor. NE Sec. 32-26-2e ..... Shut down 2,795 ft.
Tonkawa Development Co.'s No. 1 McDaniels, SE cor. SE Sec. 15-25-1w ..... Fishing 4,638 ft.
Corley and others' No. 1 Williams, SE cor. NE SW Sec. 7-21-1w ..... Shut down for casing 1,930 ft.

WOODWARD COUNTY

Otstot Development Co.'s No. 1 Simmons, SE cor. SE Sec. 32-24-17w ..... Shut down for pipe 1,430 ft.
Wight & Wahl's No. 1 Williams, C NW Sec. 16-23-20w ..... Rig.
Randau & Mooney's No. 1 Parker, SE cor. NE NW Sec. 4-23-16w ..... Cleaning out 1,132 ft.
Sharon Oil Co.'s No. 1 Elmore, SW cor. SW Sec. 25-21-21w ..... Shut down 2,772 ft.
Burgoyne Brothers' No. 1 Barnes, SW cor. SE NE Sec. 15-21-19w ..... Shut down 870 ft.
Wight & Wahl's No. 1 James, C NW Sec. 16-23-20w ..... Rig.

GARFIELD COUNTY

E. L. Love and others' No. 1 White, SE cor. NW Sec. 9-24-6w ..... Hole full of water 4,650 ft., shut down 4,720 ft.
Falling et al's No. 1 Gorusch, SE cor. SE Sec. 14-24-3w ..... Swedging pipe 4,767 ft.
Fleming and others' No. 1 Wengert, NW cor. NW Sec. 3-22-5w ..... Shut down 750 ft.
Beopple and others' No. 1 Schweer, C SW NE Sec. 12-21-4w ..... Shut down 1,850 ft.
Marland and Barnsdall's No. 1 Looman, NE SE Sec. 9-20-4w ..... Shut down 5,740 ft.
Marland Oil Co.'s No. 1 Miller, SW cor. SW Sec. 12-20-4w ..... Shut down at 4,536 ft., waiting on test Sec. 9-20-4w.

ELLIS COUNTY

Oklahoma Northern's No. 1 Young, NW cor. NW Sec. 9-21-25w ..... Shut down 300 ft.
Hoffman and others' No. 1 Ottea, NW cor. NE Sec. 20-15-8w ..... Rig blown down.

NOBLE COUNTY

Barnsdall Oil Co.'s No. 1 Bumberger, NE cor. NW SE Sec. 11-21-1 ..... Cellar.

(Continued on Page 97)

HAZARD WIRE LINES

CHAS. HEALD *Tool Dresser* — ED. SLIDER *Driller* — F. E. LANGENBURG *Tool Dresser* — E. S. BREWER *Contractor* — T. JONES *Tool Dresser* — CHAS. FELL *Driller* — W. T. SPARKS *Tool Dresser*

SERVICE

Well Done—and several others.

Mr. E. S. Brewer of Cleveland, Oklahoma, has been using in the Oxford and Churchill pool, for the Roxana Petroleum Corporation, 5,000 feet 7/8" 6x19 HAZARD Drilling Line purchased from the Bovaird Supply Company. This Rope drilled Dobbs No. 1 total depth 3,533 feet—Buffington No. 2 total depth 2,100 feet and swabbed ten days. Drilled Emerick No. 1 2,090 feet and two days swabbing. This Rope is now on Shore B No. 6 Drilling at 600 feet and reported looks as if it would finish the well at 2,100 feet.

HAZARD WIRE ROPE COMPANY

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MOUNTAIN IRON & SUPPLY CO.
Parkersburg, W. Va., El Dorado, Kans.
IVERSON TOOL CO.
Tulsa, Okla.

HAZARD WIRE ROPE COMPANY
WILKES-BARRE PENNSYLVANIA

Oil Co.'s No. 1 Bruner, NW cor. NE NW NW, Section 16-15-18, is dry and abandoned at 815 feet. Duga and others' No. 1 Robison, SE cor. NE SE, Section 36-15-18, has been abandoned at 1,390 feet. C. D. Bradley's No. 1 Young, NW cor. SE, Section 14-15-19, has been abandoned at 710 feet.

Crippy and others' No. 1 Cobb, NE cor. NW SW, Section 6-14-19, has been abandoned at 554 feet. Hettick and others' No. 2 Townsite, Lot 11, Block 16, SE cor. NE SW, Section 6-14-19, made 35 bbls in sand at 505-27 feet. Towner & Witt's No. 1 Wade, SE cor. NW SE NW, Section 6-14-19, is dry and abandoned at 827 feet. J. S. Routt and others' No. 1 Kelley, SW cor. NE NW, Section 8-14-19, has been abandoned at 759 feet. Ransome and others' No. 2 Cobb, CSL SW SW, Section 33-14-19, is dry and abandoned at 1,535 feet.

Okfuskee County

Barnsdall Oil Co. has the rig up for No. 1 Tiger, SE cor. NE, Section 31-12-10. Oriental Trading Co. has the rig on the ground for No. 1 Hully, NE cor. NW NE, Section 29-10-10.

Henry & Avers' No. 3 Buckley, SW cor. SE SW SW, Section 12-12-11, is dry and abandoned at 2,600 feet Champlin Oil & Refining Co.'s No. 5 Washington, SE cor. NW SE, Section 15-11-11, made 447 bbls. in Wilcox sand at 3,479-3,501 feet.

Okmulgee County

Lavery & Farrell made location for No. 1-A Chittim, NW cor. SW NW, Section 16-13-11. J. Crider and others' No. 1 fee, SE cor. SW NE, Section 20-16-12, is dry and plugged at 2,550 feet. J. L. Nourse's No. 1-A Rowe, SE cor. NE NW, Section 20-15-14, has been completed for 15 bbls. in sand at 760-88 feet. W. B. Pine's No 3 Eubanks, SE cor. NE, Section 8-15-14, is making 5,000,000 feet of gas in sand at 1,841-45 feet. Apex Oil Co.'s No. 1 Smith, SE cor. NE SE, Section 27-14-15, is dry and abandoned at 2,245 feet. Billy-Gene Oil Co.'s No. 1-A Monday, NE cor. SE, Section 19-13-14, is dry and abandoned at 500 feet.

Pontotoc County

Gillespie and others made location for No. 2 Fleming, SW cor. SE, Section 12-5-4.

Pottawatomie County

Darby Petroleum Co. has dug the cellar for No. 1 Harber, SE cor. NE SW, Section 23-7-4. Gypsy Oil Co. has the cellar dug for No. 1 LeClair, NW cor. SW SE, Section 23-7-4, St Louis Pool. The rig is up for No. 1 Powell, SE cor. NW, Section 19-7-5.

Indian Territory Illuminating Oil Co.'s No. 2 Sullivan, NW cor. SE, Section 25-7-3, Pearson Pool, has been completed for 548 bbls. in Viola lime at 4,159-4,180 feet. Magnolia Petroleum Co's No. 1 Hembree, NW cor. SE, Section 19-7-5, was deepened to Wilcox sand at 4,090-4,101 feet and made 600 bbls.

Seminole County

Superior Oil Corp. is building the rig for No. 2 Walker, SW cor. NE NE, Section 2-9-5, Earlsboro Pool. Marland Oil Co. is moving the rig in for No. 1 Mathis, NE cor SE SW, Section 7-8-6, Bowlegs Pool. Continental Oil Co. has the rig up for No 2 M. Cosar, SW cor. SE SW, Section 25-8-6, Little River Pool. Gypsy Oil Co.'s No. 1 M. Cosar, SW cor. NW SW, Section 25-8-6, has set the surface pipe. The Prairie Oil & Gas Co. is building the rig for No. 2 Chilcoat, SE cor. SW SW, Section 25 8-6. The rig is also under construction for No. 3 Chilcoat, NW cor. SW SW, Section 25-8-6.

Continental Oil Co. has built the rig for No. 5 Cosar, NW cor. NE NW, Section 36-8-6. Gypsy Oil Co.'s No. 1 W. Cosar, NW cor NE, Section 36-8-6, is rigging up rotary tools. Sinclair Oil Co.'s No. 4 Cosar, NE cor. NW NW, Section 36 8-6, is a location. Magnolia Petroleum Co is building the rig for No. 1 Foreman, SE cor. SW SE, Section 13-8-7. Dixie Oil Co.'s No. 3 C. Foster, NW cor. SW SW, Section 28-8-8, Wewoka area, is drilling deeper at 3,770 feet.

Westheimer & Daube's No. 2 Millner, SE cor. SW SE SE, Section 8-5-8, Allen Pool, flowed 200 bbls. from sand at 2,438-49 feet. Mid-Continent Petroleum Corp.'s No. 5 Fleet, SW cor SE SE, Section 7-5-8, topped sand at 2,560 feet, drilled to 2,620 feet and flowed 500 bbls. No. 7 Fleet, NW cor. SE SE, Section 7-5-8, made 800 bbls. from sand at 2,589-2,605 feet. No. 11 Fleet, SW cor. SE, Section 7-5-8, was completed for 511 bbls. in sand at 2,591-2,641 feet. Louisiana Oil Refining Corp.'s No. 3 Punluste, NW cor. SW SW, Section 8-5-8, flowed 1,233 bbls. from sand at 2,709-48 feet. Anderson & Prichard's No. 1 Culley, SW cor. SE NE, Section 18-5-8, made 610 bbls. from sand at 2,620-63 feet.

Devonian Oil Co.'s No 1 Smith, SW cor. NW NE, Section 12-8-6, flowed 30 bbls. from Sylvan at 4,610 feet but died and was drilled to 4,784 feet where hole was lost and abandoned. Magnolia Petroleum Co's No. 6 Rhoades, NW cor. SW, Section 12-8-6, had Wilcox sand at 4,242-49 feet, plugged back to 4,245 feet and swabbed 75 bbls. No. 4 Cruse, NE cor. SE SE, Section 2-7-6, Little River Pool, made 280 bbls. from Wilcox sand at 4,189-98 feet. Reiter-Foster O.l Corp.'s No. 1 Bunyard, SE cor. NW SW, Section 14-7-6, topped the Wilcox sand at 4,256 feet, drilled in 2 feet and made 2,765 bbls. The Texas Company's No. 1 Hotulke, NW cor. SW NW, Section 23-7-6, was completed for 5,620 bbls. in Wilcox sand at 4,165-72 feet.

Gilcrease Oil Co.'s No 1 Reed, NE cor. NW NE, Section 18-5-8, flowed 475 bbls. from sand at 2,594-2,650 feet. Sunray Oil Co.'s No. 3 Culley, NE cor. SE NE, Section 18-5-8, made 612 bbls. from sand topped at 2,564 feet and drilled to 2,636 feet. Gypsy Oil Co.'s No. 6 Sango, SW cor. NW SE, Section 1-9-5, Earlsboro Pool, is dry and abandoned at 3,515 feet after plugging back from 3,610 feet. Magnolia Petroleum Co.'s No. 5 Hammond, SE cor. NW NE, Section 10-8-6, Bowlegs Pool, swabbed 450 bbls. from Wilcox sand at 4,202-23 feet.

Wagoner County

H. H. Orr's No. 2 Grayson, SE cor. SW, Section 34-17-18, is drilling at 100 feet.

Tillman County

A. J. Bundy's No. 1 Hayter, CNL S half SE, Section 23-2s-17w, is drilling at 200 feet.

Stephens County

Pearce & Brown's No 1 Burkes, NW cor. SE, Section 5-2-6w, is drilling at 150 feet. Winkler & McQueen moved rig timbers to location for No. 1 Burns, SE cor. NW, Section 31-1-8w. Big Twelve Oil Co.'s No. 4 Taliaferro, CWL SE SW, Section 27-1s-8w, is rigging up rotary tools to deepen from 1,687 feet.

Harry Hanbury's No. 7 Taliaferro, SW cor. NW SW, Section 27-1s-8w, had sand at 2,198-2,200 feet and is pumping 40 bbls. Big Twelve Oil Co.'s No. 8 Taliaferro, NE cor. SE SE SW, Section 27-1s-8w, was completed for 60 bbls. in sand at 1,390-1,410 feet. Medlin and others' No. 3 Burke, NE cor. NW NW NE, Section 34-1s-8w, is a 100-bbl. well in sand at 1,672-80 feet. Wirt Franklin Oil Corp's No. 2 Fobb, CEL NE SE, Section 12-2s-8w, is swabbing 200 bbls. from sands at 1,516-24 feet and 1,527-50 feet. American Pipe Line Co.'s No. 3 Bond, CWL NW SW, Section 7-2s-7w, is swabbing 285 bbls. from sand at 1,516-40 feet. Petroleum Producers Co.'s No. 1 Brown, NW cor. SW NW, Section 7-2s-7w, made 133 bbls. from sand at 1,568-71 feet.

Greater Seminole Production

The production of the Greater Seminole area by companies and leases Thursday, May 3, is given below:

Little River Pool

Company, farm—	Location	Wells	Prod.
Amerada:			
Nitey	2- 7-6	3	2,445
Amerada-Wilcox:			
Fore	35- 8-6	2	690
Barnsdall:			
Hotulke	22- 7-6	1	30
Blackwell:			
Nitey	35- 8-6	6	2,483
Carter:			
Fish	36- 8-6	6	1,410
Jackson	11- 7-6	1	695
Continental:			
Cosar	36- 8-6	3	2,010
Gypsy:			
Brown	33- 8-6	1	50
Conrad	22- 7-6	1	50
Campbell	36- 8-6	3	205
Denmark	11- 7-6	1	50
Mungee	1- 7-6	1	40
Hulhoke	14- 7-6	1	1,405
Pottie	35- 8-6	3	305
Renton	11- 7-6	1	2,000
Independent:			
Harris	23- 7-6	1	140
Davis	2- 7-6	3	2,065
I. T. I. O.:			
Campbell	1- 7-6	1	83
Dungan	35- 8-6	3	2,115
M. A. House	1- 7-6	1	150
W. E. House	1- 7-6	1	54
W. E. House "B"	2- 7-6	4	2,394
Hull	26- 8-6	1	76
Jackson	1- 7-6	3	1,910
McCulla	1- 7-6	3	827
Nitey	2- 7-6	7	1,042
Phoebe "A"	36- 8-6	3	710
Phoebe "B"	36- 8-6	4	345
Reed	1- 7-6	1	61
Soketheche	1- 7-6	4	920
Magnolia:			
Cruse	2- 7-6	3	1,440
Pottie	35- 8-6	4	695
Mid-Continent:			
Bruner	.....	..	4,340
Smith	5- 7-7	1	20
Wadsworth	36- 8-6	7	890
W. B. Pine:			
Hoyecha	26- 8-6	1	884
Pine-Phillips:			
Pottie	35- 8-6	2	940
Pure:			
Harjo	11- 7-6	1	2,755
Prairie:			
Chilcoat	25- 8-6	1	865
Dungan	35- 8-6	1	65
Houge	2- 7-6	4	1,635
Reiter-Foster:			
Bunyard	14- 7-6	1	200
Shaffer:			
Narcome	36- 8-6	1	95
Sinclair:			
Cosar	36- 8-6	2	1,200

(Continued on Page 98)

GOOD WELL IN LOST SPRINGS; SHOWS IN KANSAS OUTSIDE WELLS

By J. L. Dwyer
Staff Correspondent, Kansas Fields.

A good well on the townsite pool of the Lost Springs district of Marion County, and showings in a couple of outside wells were the best news from Kansas last week.

In the Lost Springs area, Lariaux and others' No. 1 School Lot, NW cor. NW, Section 23-17-4, made 200 bbls. daily from chat found at 2,346-2,403 feet. In the southeast part of the pool, Tom C. Johnson and the White Eagle Oil & Refining Co. have finally completed their No. 1 Thompson, SW cor. NE. Section 26-17-4, which is averaging 26 bbls. daily from chat 2,355-84 feet. This well was drilled to a total depth of 2,398 feet, and plugged back to 2,387 feet.

In McPherson County, Henry Rosenthal's No. 1 Johnson, C SE SE, Section 30-18-2w, had a show of oil in the Kansas City lime which will be passed up and the well drilled deeper. The showing was encountered at 2,315 feet. A distinct surprise was caused by finding shallow gas in Tatloyd and others' No. 2 Chinberg, SW cor. NW, Section 32-18-2w, which had 10,000,000 feet of gas from 1,445-50 feet, and will be shut in as a gas well.

In the Gorman area, Tom C. Johnson's No. 1 Gorham, SW cor. SW NW, Section 33-13-15w, topped in the conglomerate at 3,324 feet and is in to 3,326 feet, and has been swabbing 50 bbls. hourly.

Butler County

Allison & Fitzwilliams moved the rig out for No. 2 Pierce, NW cor. NE NE, Section 28-25-4. Davis, Hazlett and others made location for No. 6 Lewis, SW cor. SE SW, Section 3-27-6. Garden and others' rig is under construction for No. 2 Sluss, SE cor. NE NW, Section 6-27-6. Dixie Oil Co. made location for No. 2 Marshall, NE cor. NW NW, Section 10-27-6.

Sage, Fowler and others' No. 1 Albers, SW cor. SE SE, Section 21-25-4, was shot with 40 quarts and made 60 bbls. from sand 2,553-2,630 feet. Davis, Hazlett and others' No. 5 Lewis, SE cor. SW SW, Section 3-27-6, was completed for 100 bbls. in sand 3,130-46 feet. Shawver and others' No. 1 Nelson, NE cor. SE, Section 8-29-8, is dry and abandoned at 3,118 feet.

Cowley County

The Texas Company made location for No. 4 Hittle, NE cor. SE, Section 21-31-4. Elliott and others' No. 2 Elliott, NW cor. SE NE, Section 17-31-5, is drilling at 410 feet. Roth & Faurot's No. 1 Bement, NW cor., Section 21-31-5, is drilling at 590 feet. Skelly Oil Co. is erecting the rig for No. 1 Blakey, SW cor. NW SE, Section 31-31-6. Barnsdall Oil Co.'s No. 1 Wagner, SE cor. SW SE, Section 6-33-3, is a location. Gypsy Oil Co. has the rig on the ground for No. 1 Jennings, SE cor. NW SW NW, Section 8-33-3.

Roth & Faurot's No. 1 Stephens, SE cor. SW SE, Section 18-31-5, is dry and abandoned at 600 feet. Pryor & Lockhart's No. 2-A Drury, NW cor. NE NE, Section 31-31-6, has been completed for 25 bbls. in sand 2,915-51 feet.

Elk County

McGinnis and others' No. 1 Willard, NW cor. NE NE, Section 10-30-12, is dry and abandoned at 1,656 feet.

Greenwood County

Rhodes and others moved the rig out for No. 1 Barnard, SE cor. SW NE, Section 33-22-10. Empire Oil & Refining

(Continued on Page 98)

KANSAS WILDCATS

BARBER COUNTY

Barbara Oil Co.'s No. 1 Blunk, C NE NW Sec. 20-34-13w..Drlg. 3,275 ft.
G. W. Basom's No. 1 Grant, SW cor. SE SW, Sec. 13-31-3 .....Drlg., 789 ft.
Otstot et als' No. 1 Barlow, SE cor. SE Sec. 22-33-3w....S.D., 1,860 ft.
Rolland et als' No. 1 Pickens, NE cor. NW NE, Sec. 27-30-1w .....Drlg., 3,210 ft.
J. K. D. Shaffer's No. 1 Carter, C SE SE Sec. 2-33-13w..Fish., 3,980 ft.
J. K. D. Shaffer's No. 1 Boggs, SW cor. NE SW Sec. 19-33-12w .....Drlg., 5,420 ft.
Skelly Oil Co. et als' No. 1 Winter, C E half Sec. 17-31-12w .....C.O., 3,550 ft; ready to d.d.

BARTON COUNTY

Everett & Wiley's No. 1 Ward, NW cor. SW, Sec. 12-20-13w .....S.D., 3,346 ft.
Huffine et als' No. 1 Smith, NE cor. SE NW, Sec. 17-19-11w .....S.D., 5,130 ft.
McJilton et als' No. 1 Evanston, SE cor. NW, Sec. 34-17-11w .....Rig.

BUTLER COUNTY

Derby Oil Co.'s No. 1 Bughman, C SW SW Sec. 21-18-2w.Spudded.
LaRobb et als' No. 1 Bronsenger, NE cor. SW, Sec. 24-27-3 .....Rig.
Mid-Kansas O. & G. Co. et als' No. 1 Harsh, NE cor. SW, Sec. 5-24-3 .....Drilling 900 ft.
Joe Ligget's No. 1 Travender, NW cor. SE Sec. 24-23-6..Drlg., 2,530 ft.
White Eagle O. & R. Co.'s No. 1 Dixon, NE cor. SE SW, Sec. 1-27-6 .....Hole full wtr., 3,089-3,105 ft; S.D.
H. F. Wilcox O. & G. Co.'s No. 1 Littell, NE cor. SE NW, Sec. 21-29-4 .....Collapsed csg., 1,453 ft; S.D.

CHASE COUNTY

Grisner & Fowler's No. 1 Carson, NE cor. NE, Sec. 9-21-7 .....S.D., 2,025 ft.

CLOUD COUNTY

Concordia P. & R. Co.'s No. 1 Murdock, SE cor. SE, Sec. 6-6-4w .....Fish., 3,590 ft.

COWLEY COUNTY

Allison & Fitzwilliams' No. 1 Shapland, NE cor. NW SE, Sec. 20-30-6 .....S.D., 790 ft.
Barnsdall Oil Co.'s No. 1 Russell, NE cor. NW SE, Sec. 15-33-4 .....Drilling 2,318 ft.
John Herron et als' No. 1 Marshall, SW cor. NE, Sec. 36-30-6 .....S.D., 1,645 ft.
Otstot et als' No. 1 Volker, NW cor. NE, Sec. 9-35-1....Rig.
Harris & Hahn's No. 1 Gamble, C NW NW Sec. 17-35-2..S.D., 1,400 ft.
E. B. Shawver et als' No. 1 Disser, NW cor. NW, Sec. 10-34-3 .....Drlg., 3,055 ft.
E. B. Shawver's No. 1 Mullett, C NW SE Sec. 21-34-3....Drlg., 3,005 ft.
Vickers Pet. Co.'s No. 1 Daniels, NE cor. NW, Sec. 3-30-3 Drlg., 1,640 ft.

(Continued on Page 98)

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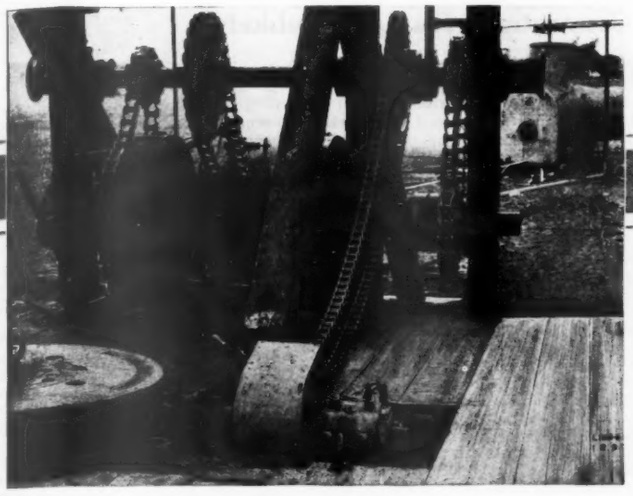

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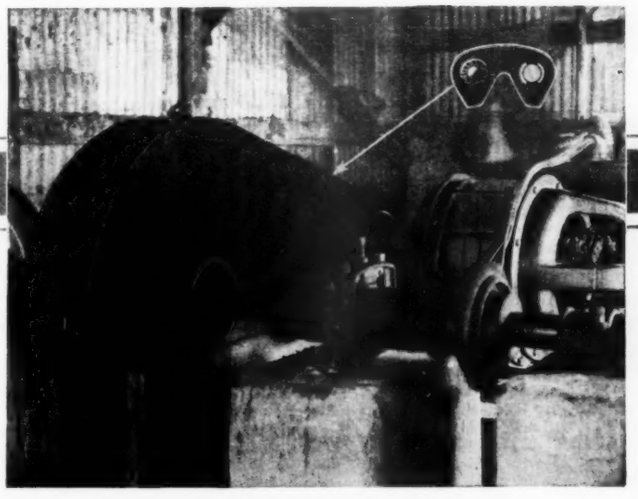

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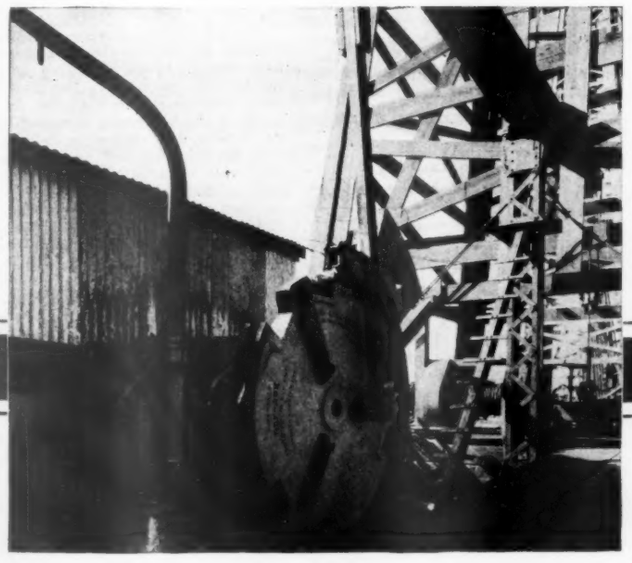

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LINK-BELT

New Tests Start South of Lockhart

Branyon Well in Caldwell County, Texas, About 8 Miles From Bruner Austin Chalk Well, but Connection Thought Unlikely

By B. D. Stevenson
Staff Correspondent, Southwest Texas

SAN ANTONIO, Tex., May 7.—Several tests in the new pool opened 4 miles south of Lockhart by the Bute No. 2 Branyon, now carried as The Texas Company's No. 2 Branyon, are getting started or trying to get started. The Claude Smith and others, on the northeast trend of the structure and nearly three-quarters of a mile northeast of the discovery well, on last Friday was down 1,600 feet and due to top the pay early this week. The discovery well was spudded in and completed in 10 days with total depth 2,244 feet. Lack of water is bothering the field. T. I. Branyon, a farmer, is laying a water line from a spring on his farm, and Charles Cartter is laying a 2-mile water line from a source of water supply, but late last week had not completed it, and had not yet spudded in his No. 1 Ike Heidenheimer, which is about 450 feet southwest of the discovery well. The chances are seven or eight tests will soon be under way in the new field, and in addition three and possibly four new tests will be going in the new Bruner Field in the southern part of Caldwell County, where Joe Bruner got the first Austin chalk well of any importance in this part of the country.

The Branyon well is about 8 miles north of the Bruner well, and there is no thought that the two will ever connect, though the Branyon well got production after going 169 feet into the Austin. At that point it cored through the fault plain and got Del Rio, which explains nothing as to where the oil is coming from except that it is coming up along the fault plain. The Branyon well, which came in Saturday, April 29, sanded up on Monday, 22 hours later after producing a total of 670 bbls. in the 22 hours. It had flowed between the drill stem and casing. Connections were then changed to let it flow through the drill stem, and it started producing again and the third day made 451 bbls., but with the flow restricted to three-fourths-inch choke. Later, production increased, and Thursday it was making 35 bbls. an hour, but sanded up again. Production was coming through two holes in the fishtail bit, and it could easily sand up under such conditions. It was making about 5 per cent basic sediment and water.

The drill stem was taken out of the hole Friday. The well, when it started to drill in Sunday, April 29, didn't get within 30 feet of the bottom when it started making oil, and with the 30 feet in the bottom filled with shale when the hole was reamed down to set casing the well has been producing, and with the drill stem removed it filled 1,600 feet with oil. It will be drilled to the bottom of the hole and given another chance to produce.

District Getting Play

There is a disposition to play the territory north and south, even though it is claimed that The Texas Company's No. 2 Branyon and the Joe Bruner No. 1 Davis will never connect as a field. Both are producing from the Austin formation, or something close to it. The wells are 9 miles apart. Six miles nearly due south of The Texas Company's No. 2 Branyon is the Smith-Sutton No. 1 Carter, which is also supposed to be with the bottom of the hole somewhere in the Austin chalk or formation next below it. The well has shown considerable oil but is in bad condition and has never been completed. There is all sorts of casing and tubing in the hole and some of it is supposed to be parted and for some time the well has been left standing with the valve closed. When opened recently a couple of times it has shot a stream of oil as big as a man's wrist for several minutes and considering the condition of the well this is considered remarkable and significant. The Bruner well is about 3 miles a little west of south of the Smith-Sutton well. Smith-Sutton are starting another test 900 feet east of their first test.

Tests around the new discovery well up to late last week were as follows: United North & South Co. had a derrick up on the Branyon farm about 600 feet due northeast of the discovery well and Charles Cartter was rigged up about 450 feet southwest of the discovery well. The Texas Company had a derrick up about 600 feet on farther northeast from the North & South, and Roxana corporation had a derrick and rig a little northeast of that. J. M. Davis had derrick and rig up nearly in line with the other wells and about three-quarters of a mile southwest of the discovery well, and Claude Smith was drilling at 1,600 feet three-quarters of a mile northeast of the discovery well. The Texas Company's No. 1 Teas has spudded in a full mile southwest of the discovery well. The line-up is all on the supposition that it will be a narrow shoestring affair.

T. C. Hadley is preparing to drill on the Tiller lease in the Gerren Hinds Survey, a little over a mile north of Joe Bruner's No. 1 Davis which came in recently at 2,688 feet, producing from the Austin chalk. Hadley's location is approximately in the northeast corner of the Tiller farm in Gerren Hinds Survey. M. O. Rayor is rigged up ready to drill the No. 1 M. August, a mile northwest of Bruner's well, and J. H. Dufner and J. S. Shoenberg are rigging up in the southeast corner of the 25 acres off the north end of the Ira Huff 65-acre tract about a mile north of Bruner's well. Bruner is rigged up on his No. 1 Thomas Wilson, 400 yards north of No. 1 Davis. No. 1 Wilson was spudded in and the rig was then moved back to No. 1 Davis and that test deepened to its present depth. Now the rig is back on No. 1 Wilson and it will be completed.

Refugio Field

In the Refugio Field the industry is waiting to see the completion of Retherford and Heap's No. 1 Strauch in the north end of the field. On a drill stem test is showed for a big gas well at 3,670 feet and some enthusiastic admirers of the well are fixing its probable volume at 120,000,000 feet. That seems altogether too high but it will probably make a big well. It is the first that will be completed in that sand. Houston Gulf Gas Co. has a well a little over a quarter of a mile away, the depth of which was given out as "about 3,000 feet," that is standing with mud in the hole and valves and christmas tree on the well. It was never tested. The field is proving one of the finest gas fields in the country. Retherford & Heap set casing Saturday, April 28, and are expecting to drill in and test early this week. Saxet Oil Co. has a well at 2,868 feet that looks like a big gas well and is also in probably a different sand from any other in the field. Houston Gulf Gas Co. opened a new sand some months ago at about 3,300 feet and most of the wells in the shallower sands around 1,800 and 2,400 feet have been deepened to this new sand. One, the Shelly No. 2, is reported making so much oil the company quit using it as a gas well.

White Point Field

Another interesting "comeback" in proven territory in Southwest Texas is the Saxet Oil Co.'s No. 7 Rachel in the White Point Field in San Patricio County, a little north of Corpus Christi. The well through a split in the casing started to run wild early this year after having been a good tame gas well for six months. Since then it has been on fire and the fire put out time after time. It was about conquered and had subsided and a derrick was started in the crater 40 feet below the surface of the ground to try and cap the thing when it started wild again and caught fire once more. It was finally put out by pumping water into one of the Houston Oil Co. wells 300 feet away and closing in all other wells in that sand. This brought the water to the wild gasser in such volume that the fire was put out and the well finally mudded off. Then it was completed and the casing repaired and the well brought back in and gauged 72,000,000 feet. The only damage to the field seems to be the gas that went into the air.

Laredo Territory

In the Laredo territory interest still centers around the Cole Petroleum Co.'s new field in Webb County, 4 miles west of the Cole gas field in Duval. The last well, Cole Petroleum Co.'s No. 56 Benavides in the northeast corner of Block 3 of Survey 412, seems to be about the best oil well yet. It came in gas and this week on a half-inch choke has been making 200 bbls. of oil a day. It is the farthest north of any of the wells in the field, there being eight producers at this time, and it may prove to be the best well in the field. A production of 1,000 to 2,000 bbls. daily could probably be maintained for the field. Air lift is being put on the wells conserving the gas pressure and with the field fully equipped it will soon be the biggest producing pool in the Mirando district. No. 57 is standing 800 feet in oil and is the farthest west producer in the field and Nos. 58 and 59 are about ready to complete. Magnolia Petroleum Co., the only other operator in the field, has topped the sand and set casing in No. 1 Valdez at about the same depth as the Cole Petroleum Co. wells and will probably soon have a producer. It is 700 feet east and 300 feet north of Cole Petroleum Co.'s No. 56 Benavides. It will amount to quite a lot of it makes a producer for it will prove up several locations. It tested gas.

Another feature of the Laredo territory is O. W. Killam's No. 8 Bruni, in the new Albercas Pool. Gas was the first thing found in the pool and then some of the wells began making oil. Now Killam's No. 8 Bruni with casing at 2,176 feet and sand at 2,176-82 feet is standing 1,380 feet in oil with no water and it looks more than ever like an oil field.

COMPLETIONS

Atascosa County

Eckert and associates' No. 1 C. T. Tom has been abandoned at 1,507 feet, total depth, with oil showing at 585 feet thought good for one-half bbl., gas showing at 950 feet, otherwise dry. Well drilled out of Cook Mountain a little way into Mount Selman.

Caldwell County

Dr. James H. Bute's No. 2 Branyon, R. B. Jarmon Survey, 5 miles south of Lockhart at 2,243 feet, drilled in and

(Continued on Page 179)

OIL SHOWING IN FRIO COUNTY TEST; THREE PLANNED IN GUADALUPE

By B. D. Stevenson

SAN ANTONIO, Tex., May 7.—Wildcatting in Southwest Texas got rather scant attention the past week with most of the attention centered on the No. 2 Branyon and Joe Bruner's No. 1 Davis in Caldwell County which are now in the proven class. Blue Ribbon Oil & Gas Co. got a showing of gas Thursday night of last week in No. 1 Edwards at about 2,450 feet in the north edge of Frio County and about 6 miles due south of the Adams gas field in Medina County. The pressure was sufficient that it started to bring the fluid out of the hole and they sat up with it all night. Friday morning there was a little oil showing. It was decided to run a drill stem test on it.

Eugene Sights, who drilled some tests in the territory in Guadalupe County between Seguin and the Guadalupe County end of the Luling Field, is to drill three more. They will be carried under the name of P. H. Poole and are a further attempt to prove out the structural conditions in that part of the county where more or less drilling has been going on ever since the Luling Field was discovered. The locations have not been definitely selected and announced but one will be near the Sophie Henshel well, another between that and the Sipes Springs well and the other 2 miles south of Kingsbury.

F. H. Eckert and associates' No. 1 Blake, 8 miles northeast of Campbellton, is in rock at 460 feet. It is in a territory that has a lot of good oil showings at shallow depth, but has never produced a commercial well yet. Jim Harper will drill another near the Calliham Field on the Tom Brown farm and within 300 feet of the Live Oak County and McMullen County line.

Pure Oil Co. has been held up in a fishing job in its No. 1 Smythe in the southwestern part of Uvalde County. Pundt (Tri-Tex Oil Co.) has completed his second gas well in the northern part of Zavala County and is starting the third a mile west of the second and has pipe ordered to lay a gas line to Uvalde, 12 miles north.

Duval County

Partee and others' No. 1 Hahl, Survey 78, Block 16, located 500 feet to north line and 150 feet to west line, is drilling at 1,700 feet. National Oil Co.'s No 1 Ball, Survey 16, located 450 feet to north line and 150 feet to east line, is standing at 2,212 feet. Houston Oil Co.'s No. 1 Woods-Welder, Survey 233, located 1,750 feet to west line and 100 feet to north line, is standing at 3,500 feet, having trouble with the boiler.

Hidalgo County

Queen City Oil & Gas Co.'s No. 1-A Adams, Survey 82, located 2,640 feet to north line and 1,320 feet to east line, is drilling at 130 feet. D. L. Smith Oil Co.'s No 5 Fernandez, Porcion 46, Block 34, is drilling at 3,300 feet. Hargil Oil Co.'s No. 1 D. F. Stevenson, Las Mestines grant, is location 150 feet to south and east lines.

LaSalle County

Southwestern Petroleum Co.'s No. 1 Beckwith, 1,320 feet south of Nueces River and 1,388 feet of northwest lines of Survey 19, is drilling at 700 feet.

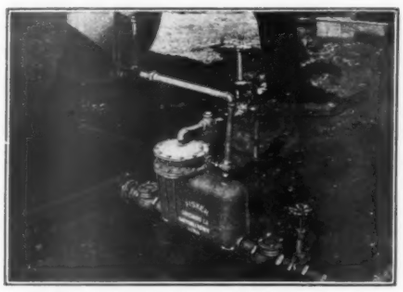
Jim Hogg County

W. C. Berg's No. 1 N. Hinnant, Survey 19, Block 9, located 250 feet to west line

(Continued on Page 179)

FISHER

Vacuum Fluid Extractor



Type 36 Extractor installed on Vacuum Intake Scrubber Tank, at the Phillips Pet. Co., Hutchinson Co., Texas.

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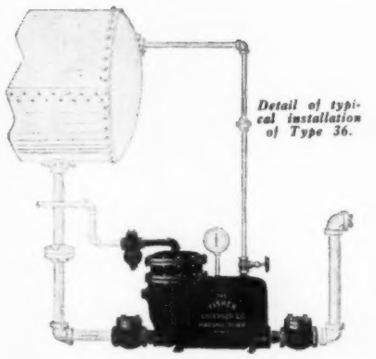
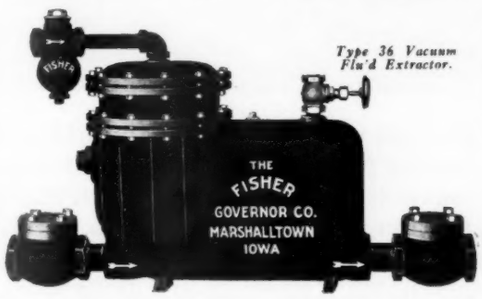


Detail of typical installation of Type 36.

The FISHER Vacuum Fluid Extractor uses air, gas, or steam under pressure for the removal of any liquid under vacuum from a scrubber tank, vacuum collecting line, or receiver, etc., but are most extensively used in the oil and natural gas fields for trapping out gasoline condensate.

After the well or rock pressure has been exhausted from a producing area, vacuum is applied to the wells to increase the production of oil and gas. The collecting lines are also under a vacuum so that the gas is "drawn" to the compressor station or natural gasoline plant instead of being "pushed-in" by pressure.

Before the collected gas can be successfully handled at the plant, all foreign liquids such as oil or gasoline condensate must be removed. Unless this is done, there is the grave danger of the liquids being carried into the plant where they may cause serious fires or explosions with resultant loss of life and property. In addition, the plant equipment is filled with foreign material and the quality of the product impaired by discoloration, odor, etc.



Type 36 Vacuum Flu'd Extractor.

These foreign elements collect in low portions of the collecting lines where they are usually trapped into tanks or receivers and blown to the atmosphere at regular intervals by auxiliary pressure under manual control. At the plant, scrubber tanks, separators, or receivers are used to separate the liquids from the gas. Here also the liquids are blown from the tanks by an operator who manipulates a system of valves. *The FISHER Vacuum Fluid Extractor Type No. 36 takes the place of this operator, and removes these liquids automatically without human attention.*

A full detail of this Extractor is covered in Bulletin 55—a copy will be sent upon request.

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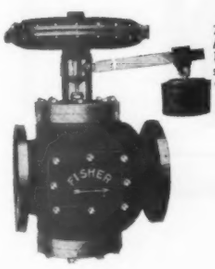

Type 210 Gas Pressure Regulator or Reducing Valve for controlling pressures in distributing and service mains and reinforcing lines. Write for Bulletin 6.

Type 14 Back Pressure Valve made in several styles—diaphragm, spring or cylinder control. For service up to 250 lbs. Write for Bulletin 10.

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CENTRIFUGAL PUMPS FOR EVERY SERVICE

Champagnolle Assumes Importance

Rushing and Others' No. 1 Gregory Averaged Over 4,400 Bbls. Daily for First Six Days. Much New Work Projected

By D. H. Bancroft
Staff Correspondent, Louisiana-Arkansas

EL DORADO, Ark., May 7.—Completion of the biggest well in Arkansas since Smackover third sand was tapped four years ago, reached its peak and settled to a fraction of its best production, is confirming the new deep sand in the Champagnolle district of Union County as the pot of gold at the rainbow's end on which pretty hope the field took its locally-known name of Rainbow City. The completion in point, Rushing and others' No. 1 E F. Gregory, in the SW cor NW SW Section 11-17-14, started off with 3,927 bbls. of 36.4-gravity oil from 16 feet of sand, total depth 3,208 feet with the bottom 16 feet in the pay, but has increased from day to day until, six days after it was bailed in, it put 4,437 bbls. into the tanks in 24 hours. There was three-tenths of 1 per cent b.s. The well made 4,675 bbls. on the previous 24-hour gauge, and over 4,400 bbls. a day the first six days.

It has overshadowed everything in the Shreveport division, particularly in the south Arkansas section, and El Dorado is once more hopeful and coming out of the low spirits that have held it for the last year. The probable effect of the deep sand discovery in Champagnolle will be deeper drilling in Smackover and the original El Dorado Field; also in the Lawson-Urbana section about 13 miles south of Champagnolle, where there was much gas a year ago and some show of oil. This is having, through new deep stuff in Cotton Valley, a corresponding effect on the Haynesville and, possibly, Homer Fields in Claiborne Parish, rumors during the week of plans for another deep test in Haynesville being the first intimation to this effect. Haynesville already has had one test to a little below 4,000 feet which yielded 40 bbls., but developments elsewhere in the Mid-Continent about that time which had far better results discouraged further pursuit of deeper production in this field.

Meanwhile, Rushing is drilling No. 2 Gregory in the same section and lease at 2,762 feet and is reported having three more in prospect, while the last report of the Arkansas Conservation Commission shows permits issued for 14 new jobs, most of which are well under way, and it is expected that a half dozen or more of them will be at testing stage during the next week or 10 days. The first of these probably will be Lion Oil Refining Co.'s No 1 Rowland in the NE cor. NE NE Section 15-17-14, which has 6⅝-inch casing cemented at 3,192 feet for a test of 5 feet of sand at 3,200-05 feet.

Need Trading

There is much trading, or negotiating for trades, in Champagnolle stuff with several interests which have held off, doubting from the performance of the few wells that have been completed in the upper sands that the pool would be profitable, making the overtures. During the week Lion Oil Refining Co. took over the Arkansas Drilling Co.'s stuff in Section 15-17-14 for $20,000 cash and payments out of the first oil up to $50,000 more, agreeing to drill the two locations already made by the vendors who will finish the one now under way, No. 1 Rowland. Also, Root Refineries, Inc., is reported having taken over Simon and others' well and surrounding acreage in Section 21-17-14 and will drill the test, No. 1 Jerry, which is standing with 92 feet of 10 inch surface casing set. Lion Oil Refining Co. is reported to have location in Section 9-14-17 for No. 1 Kelly, but there is no check; C. F. Noble of Tulsa is reported to have location for No. 1 O. T. Murphy in Section 36-16-16, 5 miles northwest of El Dorado, for a deep test to 4,000 feet, and Sinclair Oil & Gas Co. is similarly reported to be planning entering Champagnolle.

The Rushing completion, being so much bigger and in the new sand, overshadowed Champagnolle's second completion during the week, Magna Production Co.'s No. 2 Rowland in the SW cor NW NW Section 14-17-14, which, producing from what is believed to be a stray sand, is flowing 120 bbls. of clean oil through 2-inch tubing from 14 feet of sand, total depth 2,974 feet.

J. O. Moore, trustees, No. 1 Pagan in Section 18-18-11, 5 miles northeast of Strong, attracted more attention than did the Magna well by virtue of a gas show in 5 feet of sand, total depth 2,716 feet, for which a drill stem test was scheduled. E. M. Jones has gone back to his No. 1 Stegall in Section 22-17-14 and will deepen it looking for the 3,200-foot stuff in Champagnolle proven area. He abandoned the hole at 3,250 feet, but figures his elevations place him above the new deep stuff to the north.

The Magna Production Co. has killed No. 2 Rowland, Section 14-17-14, Union County, Arkansas, which was completed April 27 flowing 1,200 bbls. of oil through tubing and packer from a stray sand in the Champagnolle Field at 2,974 feet, and will drill deeper for the 3,200-foot production.

Twenty-four Completions

The week's completions list was considerably longer than in some time, but eight failures amounted to one-third the total. There were 13 gassers scattered through the division with an initial 141,186,000 feet open flow and three producers with 4,053 bbls. initial, the latter including the two Champagnolle wells spoken of. The Cartersville district of northeastern Bossier Parish accounted for one average size gasser and a failure. The latter was Louisiana Oil Refining Corp.'s second completion of No. 1 Blanton in Section 23 23-12, which had 1,000 bbls. of oil and 20,000,000 feet of gas as its initial production at 3,096 feet, April 6, 1927, declined to almost nothing within a comparatively short while and was lately plugged back to 3,050 feet. Cement was drilled out to 3,085 feet and then they lost the bailer and after that a swab, and after getting the junk out and cleaning out the hole it tested salt water. The gasser was J R Bahan's No. 1 Kilgore in Section 31-23-11, gauging 37,700,000 feet, total depth 3,062 feet, and initial rock pressure of 1,060 pounds. The Elm Grove district in the opposite end of the parish likewise had two completions, both gassers in the second sand. Olmeda Gas Co. completed No. 1 Mayer, Section 30-16-11, gauging 1,500,000 feet total depth 1,940, and Palmer Corp.'s No. 10-B Caplis, Section 25-16-12, made 6,000,000 feet from a total depth of 1,876 feet.

Six Failures in Caddo

There were six completions in Caddo districts, all failures. Bayou State Oil Co.'s No. 1 Jolly, Section 27-22-15, Hosston district, was a salt water hole at 2,377 feet. So was Dibson and others' No. 1 Rives in Section 5-20-16 in the Oil City area at 1,925 feet. Since this part of the Caddo Field passed its peak 12 or 15 years ago it has continued, until lately, to yield small but consistent pumpers which returned a good net income. In the last few months, however, most of those wells drilled to the "played out" chalk rock have not been so good and the last two or three have been failures. Pine Island contributed two of the failures; Magnolia Petroleum Co.'s No. 8-A Hampton in Section 15-21-15, salt water at 4,039 feet after two such tests at 3,782 and 4,022 feet. Simplex Oil Co.'s No. 3 Baird, in Section 22-20-15, was dry at 2,265 feet

In the Monroe gas district, Southern Carbon Co. completed No. 50 fee, Section 18-19-4, Ouachita Parish, with 3,500,000 feet of gas, total depth 2,178 feet, and Industrial Gas Co.'s No. 1 Lewis, Section 14-20-3, Union Parish, gauged 4,100,000 feet of gas, total depth 2,200 feet. Industrial Gas Co. has bought from the Ouachita Natural Gas Co. (the S. S. Hunter estate) its 16-inch pipe line from near Sterling, Ouachita Parish, to El Dorado and the distributing system in the Arkansas city for a consideration not revealed but believed to be $1,500,000 or more. The Hunter interests joined with S. R. Morgan's El Dorado Gas Co. in construction of the line to El Dorado and Camden, and Hunter later bought all Morgan's interests in both before the line was completed. The El Dorado Gas Co. franchise is operated in competition with one granted a year ago to the Public Utilities Co. of Arkansas, recently merged with other Doherty properties in the Arkansas Natural Gas Co. of Delaware.

Richland Parish had one completion, W. C. Feazel's No. 1 Noble, in Section 36-16-5, a 20,543,000-foot producer, total depth 2,465 feet. In Webster Parish, the Arkansas Natural Gas Co.'s No. 1 Mitchell, Section 3-23-9, Shongaloo gas field, is a 26,000,000-foot gas well, total depth 2,688 feet, one of the largest in some time, and Magnolia Petroleum Co.'s No. 1 Viola Mitchell, Section 31-23-9, is making 28,000,000 feet of gas, total depth 2,684 feet. The last two or three of the Magnolia's completions in the north Webster gas fields have been rather disappointing, being very small producers—probably because they happened to hit a particularly tight spot in the sand rather than because of drainage as some opinion at the time surmised. Rock pressure on the Mitchell well, however, was considerably lower than the average, being only 310 pounds.

Two Cotton Valley wells in the new deep stuff failed to show any improvement on second completion. R. W. Norton's No. 1 Josey & Massey, in Section 27-21-10, was listed at its original rating of 4,000,000 feet of gas at the same depth—4,675 feet. When the Ohio's Crichton well in Section 21-21-10 came in so well Norton decided to pull liner and drill his a little deeper, but he couldn't get the liner out.

Also, Woodley Petroleum Co.'s No. 1-B Cox, Section 23-21-10, remains a 4,000,000-foot gasser at 4,695 feet. Completed September 23, 1927, as a 4,000,000-foot gasser at 4,310 feet, this well was deepened to 4,737 feet where it made the same amount of gas with 200 bbls. of salt water and about 40 bbls. of 50 gravity oil, being the inspiration for the Ohio's two deep wells which went past all prior depths in Cotton Valley and got the new production. Failing to make a commercial producer at this depth the Woodley well was cemented back to 4,354 feet and finished as a 4,000,000-foot gasser and last month cement was drilled out to 4,695 feet where the last test showed no improvement.

S. A. Lane's No. 1 Miles, a wildcat

(Continued on Page 181)

PROBABLE NEW GAS FIELD OPENED IN NORTHEASTERN LOUISIANA

By D. H. Bancroft

SHREVEPORT, LA., May 7—Probabilities of a new gas field being opened in rank wildcat territory of northeastern Louisiana appeared Saturday when Palmers Corp.'s No. 1 O'Brien in the center of the SE NW Section 7-19-11, East Carroll Parish, blew in with an estimated five to seven million feet of gas. The location is 30 miles east of the nearest production in the Monroe Field and 40 miles northeast of production in the Richland Parish Field on a block of several thousand acres assembled after much geophysical work had been done through that territory, and in that sense the showing is further confirmation of the virtue of the modern scientific "witchers" in locating favorable structures. Six-inch casing was cemented in the well at 2,347 feet with the bottom in one foot of sand. Total depth 2,350 feet. Plug was drilled Friday afternoon and the crew had started bailing casing when the gas followed them out with the bailer.

The well did not show up so well on being killed and deepened 4 or 5 feet. On the second test it made 15,000,000 to 20,000,000 feet of gas and 5,000 to 10,000 bbls. of salt water, and is shut in. Whether or not it is repaired and the water cut off, other wells will be drilled by the Palmer Corp. on the 43,000-acre block on which the O'Brien well is located.

Crater Unconquered

Approximately 130,000 bbls. of water have been pumped into the crater of Natural Gas & Fuel Corp.'s ill fated No. 1, Thompson, Richland Parish gas field's crater well in Section 21-16-16, since the two offset relief wells reached the sand at 2,466 feet and began their work but to date there has been no noticeable effect on the crater and apparently the only hope of its being killed is that it will bridge. To say that the 130,000 bbls. of water have been pumped into the crater, however, is not stating the case quite exactly as it is. Water has been pumped into the sand from which came the more than five billion feet of gas the crater has wasted but it evidently is not getting over to the bottom of the wild well as the boiling water filling the crater is not showing any of the dye pumped into the relief wells in quantities as recommended by the U. S. Bureau of Mines. The two relief wells started pumping three weeks ago at the rate of 6,000 bbls. per day, but so far the level of water in the crater has not changed, nor has there been any diminution in pressure or volume of gas that keeps the 300-foot crater boiling and heaving.

In the north Louisiana part of the Shreveport division 4 completions were failures and in addition tests of others revealed only dust or salt water. Greenwood Production Co., a Moody & Seagraves gas producing subsidiary, abandoned No. 1 Cooper & Ellerbe 4 miles north of Shreveport in Section 15-18-14 and visible from office building windows. After showing for 500,000 feet of gas at 935 feet, tests were made at 1,970,84 feet and at 2,000-2,015 feet. Both were dry but from then on to total depth of 3,238 feet the records show nothing to warrant testing was found. This was one of the "wildest" wildcats in the immediate vicinity as no wells have ever been drilled in that part of the parish

(Continued on Page 182)

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South Liberty Has 3,000-Bbl. Producer

Largest Well in Extension, 200 Feet From Second Largest. Spindletop Next Best Completion in Gulf Coast

By Neil W'lliams
Staff Correspondent, Gulf Coast Fields

HOUSTON, Tex., May 7.—Sun Oil Co.'s No. 3 Mitchell in the extension just north of the South Liberty Field, Liberty County, featured Gulf Coast field operations the past week. This well, flowing 3,000 bbls. of pipe line oil daily with a pressure of 1,250 pounds, is the largest by 1,000 bbls. of any of the half dozen wells so far completed in the extension pool. Sun Oil Co.'s new well is slightly over 200 feet to the northwest of the previously largest well. The Texas Company's No. 8 Staiti, which came in flowing 2,000 bbls. of pipe line oil. It is 150 feet west of Sun company's No. 1 Mitchell which flowed 600 bbls. daily, and 250 feet west of Yount Lee Oil Co.'s No. 1 Mitchell, which extended the South Liberty Field 500 feet to the north. It is the farthest west well in the extension pool.

The new production is from sand at 3,224-34 feet with the total depth of the hole 3,282 feet. This is the highest the sand has been encountered in any of the wells drilled in this extension. With the exception of the wells mentioned, other completions in the district have been small pumpers.

Spindletop, Jefferson County, got the second largest well of the week in the Gulf Coast. This was the Yount Lee Oil Co.s No. 14 fee, which came in flowing between 2,300 and 2,500 bbls. of pipe line oil through a half-inch choke. This well is an old producer deepened to a lower sand at 3,792 feet. The oil tests 32.7 gravity.

Allen Dome Producer

Allen Dome's first important producer, brought in by Roxana Petroleum Corp., April 27, flowing 702 bbls. the first 24 hours is holding up better than had been expected and Saturday was producing at the rate of approximately 200 bbls. In the week it has been producing it has made better than 2,200 bbls. of 33 gravity pipe line oil.

So far no new locations have been made on Allen Dome, which is in the extreme southern part of Brazoria County only a few miles inland from the Gulf but others are to be made in the near future. While wells of this size from such a depth, sand in this well being at 5,109 feet, are not entirely attractive completion of this well has strengthened the opinion of Roxana officials that a major field exists on this dome.

On the East Hackberry Dome, Cameron Parish, Yount Lee Oil Co. late Friday brought in its second well within a week. This was the No. 8 State, which flowed approximately 500 bbls. of net oil initially from sand at 3,925-40 feet. No. 10 State, which was completed late the previous week, flowing 2,076 bbls. through a half-inch choke from sand at 3,913-33 feet, held up fairly steadily and now is flowing more than 1,200 bbls.

Just northwest of Yount Lee's No. 10 State, a location has been made by the Galveston Oil Co. for its fourth Watkins test and a derrick is being built. The latter company is spudding in another test, No. 2 Dorian, and is starting to deepen its No. 3 Caldwell, the latter having stopped producing after having been completed only three weeks ago flowing 600 bbls. of net oil.

Bayou Bouillon Tests

Ryeade Oil Corp. is starting considerable activity at its new field, Bayou Bouillon, St. Martin Parish, Louisiana, and is starting three new tests all in Section 13-9s-8e. One of these, No. 1 State, will be drilled in 30 feet of swift water of the Atchafalaya River, 12 feet west of the east bank of the river. This is 200 feet south of No. 2 Atchafalaya fee, the discovery well, which came in flowing 4,000 bbls. of pipe line oil daily. Piling now is being driven for the derrick.

Three hundred feet east of the discovery well, Rycade corporation has a location for No. 4 Atchafalaya, and No. 5 Atchafalaya will be 100 feet east of the center of the section. Canals now are being dredged through the swamps to these locations. The discovery well has been swabbing between 300 and 400 bbls. daily but now is being rigged up to pump.

Wildcatting to Northwest

Considerable interest is being attracted from a leasing standpoint to Waller, Austin and Colorado Counties where many of the Gulf Coast companies are obtaining acreage for exploration work. While this district is somewhat to the northwest of what have been known as Gulf Coast counties, wildcatters have looked with favor on that territory.

Several salt domes are believed to lie in those counties and some drilling has been going on steadily around these, particularly at Raccoon Bend, eastern Austin County, most of the prospecting in these counties has been upon structure rather than salt dome geology. Several companies have had seismograph and torsion balance crews over that district working out structures as surface indications there are as lacking as in the coastal salt dome country.

In Colorado County, two new wildcats are being started, these being Johnson Brothers' No. 1 Beckett, north of Sheridan, 200 feet out of the northwest corner of the south 100-acre tract of the G. W. Smith Survey, and E. M. Masterson's No. 1 Miller, 200 varas from the north line and 800 varas from the west line of the William Bell Survey. Each of these operators abandoned wildcats two weeks ago in the Sheridan and Glidden vicinity.

Two other wildcats are drilling in Colorado County in the same vicinity, these being Waldvogel and associates' No. 2 Tanner, 2½ miles south of Glidden, and Rich Oil Corp.'s No. 1 Von Rosenburg fee, 2½ miles northeast of Columbus. The latter made a drill stem test of a sand at 2,532-57 feet during the week. This showed oil and gas but fresh water broke in after a packer gave way. Total depth of the hole is 2,583 feet. Humble Oil & Refining Co. also is starting a test in the Altair district to the southeast on the Colorado River, this being No. 1 Dittman.

Western Waller County

In the western part of Waller County on what is known as the Young Dome, John R. Young and associates are getting ready to drill No. 1-B fee. This prospective dome, about 8 miles south of Hempstead, was worked out about a year ago by Mr. Young through geophysical instruments. A number of larger companies have taken acreage and royalty interests in the dome prospect.

Raccoon Bend, another salt dome prospect in northeastern Austin County, has been drilled steadily by the Humble Oil & Refining Co., which has two tests drilling there now, the No. 1 Wilson at 4,081 feet, and the No. 1-A Grawunder at 3,415 feet, the latter being in sandy shale.

The Brenham and Brookshire salt domes also are in these counties but at present the Brenham Dome is being prospected.

Louisiana Tests

Considerable leasing for exploration purposes also is going on in the extreme southeastern part of Louisiana from Lake Pontchartrain, north of New Orleans, south to Terrebonne Bay and east to the Gulf. Humble Oil & Refining Co. and Gulf Refining Co. have seismograph crews working in that district.

In the Sorrento district of Ascension Parish, a wildcat, Acme Production Co.'s No. 1 Honest Pertuis, Section 7-10s-4e, was abandoned during the week after drilling to 2,760 feet in gumbo. This is approximately 5 miles to the northwest of Gulf Refining Co.'s Sorrento Dome, where two producers, at present shut in, have been completed. Gulf has spudded in its seventh test on the Sorrento Dome.

Gulf Refining Co. is rigging up for another test at Loreouville (Eagle Point) Iberia Parish. This will be the No. 5-Z State, Section 26-11s-8e, and is 400 feet south of No. 4-Z State, completed the first of the month pumping 100 bbls., 5 per cent water, from sand at 1,183 feet.

Capitol Oil Co. has spudded in its No. 1 Tucker, a rank wildcat, in East Baton Rouge Parish. On the Hager Dome, St. Martin Parish, Ohio Oil Co. is preparing to resume drilling at No. 1 Burke, which with No. 2 Burke, has been shut down several months because of high water. No. 1 has been standing at 1,185 feet.

In Calcasieu Parish, southwestern Louisiana, Choupique Oil Co. (Lacola Oil Co.) has abandoned its No. 1 Benkenstein at 4,582 feet, and is moving the rig to the Edgerly Field of the same parish. Rex Petroleum Co.'s No. 1 Sallier, another Calcasieu Parish wildcat, is drilling around 3,600 feet.

The Moss Bluff Dome prospect of southern Liberty County, Texas, is coming back for another test, No. 1 Sterling to be drilled by the Humble Oil & Refining Co. It is in the James McFaddin Survey, 100 feet from the north line and 8,500 feet from the east line of the 1,041-acre tract. This is the first test to be drilled here in many months.

In Harris County, H. R. Cullen has abandoned his wildcat, No. 1 Brock, a half mile south of Almeda and about 4 miles south of the Pierce Junction Field. It was drilled to a total depth of 3,524 feet.

On the Hockley Dome, Harris County, Humble Oil & Refining Co. has a rig up for No. 4 Warren. Pure Oil Co. still is bailing its No. 1 Lost River at Lost Lake, Chambers County.

Production Increases

Daily average production in coastal fields for the week ending May 5, totaled 128,310 bbls. This was an increase of 2,889 bbls. There were no important fluctuations in any of the fields, the increase being due chiefly to minor changes in various pools. Production in Southwest and East Central Texas fields was

(Continued on Page 177)

MUSKEGON FIELD'S LARGEST WELL, INITIAL PRODUCTION 360 BBLS.

By Special Correspondent

MUSKEGON, Mich., May 5.—With 22 completions, 13 of which are producing a total of more than 800 bbls. of oil every 24 hours, the Muskegon Township Field is now considered of enough importance by the Standard Oil Co. of Indiana to merit the erection here of storage tanks with a capacity for 5,000 gallons of crude oil alongside the Pere Marquette Railroad siding from which the oil is loaded into tank cars and shipped to the company's refinery at Zilwaukee, Mich., near Saginaw.

An acre of ground has been leased from Charles E. Myler, vice president of the Muskegon Oil Corp., and the tanks will be erected as soon as the flow increases to a point where it cannot be handled from the auxiliary tanks at the wells directly through the pipe line into the tank cars. At present the flow is still handled in this fashion by the Dixie Oil Co.

There are now but seven wells drilling in the field, although seven new locations recently have been announced and others, especially on the Muskegon River flats south and southeast of the present producers, are certain to be started within a short time. This is the only direction in which the extent of the field has not yet been fairly well determined by drilling.

The most important new development was the completion of the Muskegon Oil Corp.'s No. 1 A. Hinz well, which came in with an initial production of 360 bbls. It has since dwindled to but 200 bbls., but is still the largest producer in the field. It is in NE NE Section 8.

A second shot of 140 quarts in the Bull Dog Oil & Gas Co.'s No. 1 Giles, SE SE Section 6, failed to make the well a producer and the hole is being abandoned. This makes the seventh dry hole, with 13 oil wells and two gas wells which are the largest in Michigan.

Edge Pumpers

Two wells which last week gave indication of developing into little more than edge pumpers lived up to expectations. They are the Muskegon Oil Corp.'s No. 1 Torrent, SW SE Section 9, and the Reed Oil Co.'s No. 1 Torrent, NE NW Section 9, and the Reed Oil Co.'s No. 1 Torrent, NE NW Section 8. With a shot, the former developed a little gas pressure, but not enough to cause the well to flow. The hole is filled with oil, however, and drillers have put in the 6-inch casing and are about to lower 2-inch tubing. The Reed-Torrent well flowed 3 bbls. for several days and was given a light shot of 30 quarts, which slightly increased the flow.

The Dixie Oil Co.'s No. 1 Figge-B well, which came in last week, flowed at the rate of but 80 bbls. every 24 hours and will be tubed in an effort to keep it flowing. The well is in the NW NE Section 8, a short distance east of the Jolliet-Morris Development Co.'s No. 1 Nichols, until the completion of the new A. Hinz well, the largest in the field.

Hagan & Hagan, contractors on the Dixie Figge-B, are preparing to move to the southeast corner of the same property to drill No. 2 Figge-B opposite the new A. Hinz well of the Muskegon Oil Corp. The new Dixie well also will be in the NW NE Section 8.

Wells are now drilling as follows: Lake Shore Petroleum Co.'s No. 1 DeVries, SW NE Section 8, at 300 feet; Wolverine Oil Syndicate's No. 1 Kooi, SW NE Section 8, 350 feet; Bradley & Bradley's No. 1 Layman, SW NE Section 8, 500 feet; Citizens Petroleum Co.'s

(Continued on Page 98)

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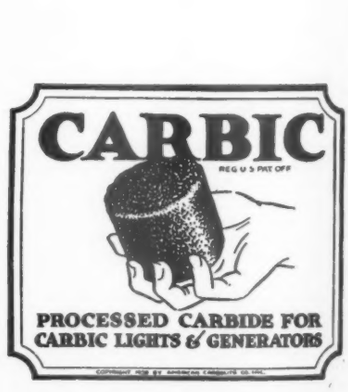

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Oregon Basin Producer Flows 300 Bbls

Well in Lea County, New Mexico, North of Leek Well in Winkler, at 2,980 Feet With 3,000,000 Feet of Gas

By Tolbert R. Ingram
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., May 5—The Oregon Basin operation in Park County, Wyoming, attracted considerable attention this week when the Charles E. Orchard's No. 1 Rue was drilled into the Tensleep sand with rotary tools and was completed for a 300-barrel well, the core showing an interval of 302 feet between the top of the Embar and the top of the Tensleep sand. The Cody Petroleum Co. has contracted for the sale of its Oregon Basin crude to the California Petroleum Co., and the Producers & Refiners secures a block of permits for drilling as a result of a decision by the General Land Office. The Midwest and Wyoming Associated companies had one completion in Salt Creek, a 60-bbl. well, and a well near the Teapot Dome pumped 200 bbls. initial. Southern Natrona County appears to be coming in for a play and the Honolulu Consolidated and Producers & Refiners are starting a joint test on the Pitchfork structure in Park County, and the Midwest is starting a new test in Lincoln County.

In New Mexico interest still centers in the Gibson & Johnson well across the line in Winkler County, while the Marland Production Co.'s Eaves well 5 miles to the north is at 2,980 feet with 8,000,000 feet of gas. One new location in Chaves County was announced.

In Utah, the Midwest Exploration Co.'s Ashley Creek test made 5,500,000 feet of gas after being plugged back and gauged.

Colorado has a new pipe-line project under negotiation to supply Durango from the Ute Indian Reservation in New Mexico, and the Shaffer Oil and Refining Co.'s No. 205 Yarg on the Iles Dome has an important show in the Morrison sand, this being a key well down structure that will add considerable proven area if a producer. The Florence district has several good completions and new tests announced include one in La Plata County and another in Moffat County.

Wyoming

The Oregon Basin operation in Park County supplied the most interesting news from Wyoming. One important development was the completion of Charles E. Orchard's No. 1 Rue, in the SW cor. Section 28-51-100, on the northeastern flank of the south dome at 3,890 feet in the Tensleep sand. The well is flowing 300 bbls. a day by heads and if allowed to produce and clean itself, it is possible the quantity will be increased considerably. It was the first well in the field to be drilled into the sand with rotary tools. Heretofore all drilling in has been done with cable tools. There has been considerable doubt as to the identity of the horizons in which some of the wells have been completed and the formation has been referred to as the Embar-Tensleep series, it not being definitely established where the Embar ended and the Tensleep commenced. The Orchard well took cores all the way down so that a better lineup on the formations has been secured and it is now believed this well is the first so far actually drilled any distance into the Tensleep. The Cody Petroleum Co.'s No. 1 Klindt, SE NE Section 7-51-100, on the north dome, which topped the Embar at 3,539 feet and was drilled to 3,786 feet, may be an exception, it being claimed it topped the Tensleep at 3,769 feet. If that is correct the Embar was only 247 feet thick in the Klindt well compared with 302 feet in the Orchard well. The core from the Orchard well showed thin strata of lime imbedded in the sand which may have caused the uncertainty regarding the cable tool test. It also revealed a hard caprock over the Tensleep while heretofore it was believed there was no caprock. The Orchard well topped the Embar at 3,531 feet and the Tensleep at 3,833 feet, the last-named horizon being drilled to 3,890 feet and showing saturation all the way down. The Ohio Oil Co.'s No. 1 Sonners, the discovery well on the north dome drilled in a year ago, appears to have just about penetrated the Embar and possibly to have entered the Tensleep. Orchard has made a location for No. 2 Rue in the NW NW SW Section 28-51-100, a little less than half a mile north of No. 1 and farther down on the structure.

Dispatches from Washington state that a contest over a large tract of land on the northeastern flank of the north dome has been settled by the General Land Department in favor of a group of Basin, Wyo., people who had claims that were contested five years ago by the Enalpac Oil & Gas Co. These claims were originally permits issued to P. W. Metz, C. W. Atherly and Darby Hand and afterwards consolidated. The permits cover sections 33 and 34-52-100 and some surrounding ground and join on the north and west some permits under lease to the Producers & Refiners Corp. The ground has been checkerboarded by the holders and the Producers & Refiners and the latter will be in charge of the drilling.

Oregon Basin

Oregon Basin drilling operations showed considerable progress upon several wells. The Ohio Oil Co.'s No. 1 Baston, NE cor. Section 6-50-100, on the south dome, is drilling at 3,770 feet in the Tensleep. It topped the Embar at 3,427 feet. The well is flowing by heads while drilling is under way at the rate of 250 bbls. a day. This should be an early completion. The same company's No. 3 Sonners, NW NE NW Section 8-51-100, is drilling at 3,446 feet and is still in the Embar topped at 3,351 feet, making small flows by heads. The Ohio's No. 2 Wilson, NW cor. Section 4-50-100, is on top of the Embar, showing some saturation at 3,554 feet at which depth the 6⅝-inch casing is being run preliminary to drilling in. The Producers & Refiners' No. 1 Frisby, SW cor. NE Section 32-52-100, is drilling at 2,378 feet. The Continental Oil Co.'s No. 1-A State, NW cor. Section 16-51-100, is drilling at 2,305 feet. The Cody Petroleum Co.'s No 2. Klindt, NE NE Section 7-51-100, is fishing at 3,245 feet. The Ferdig-Wyoming Oil Co.'s No. 1 Hough, SE cor. Section 19-51-100, in the saddle between the north and south domes, is drilling at 3,835 feet in the Embar and occasionally slops over the top while being agitated. The Lenco Petroleum Co.'s No. 1 Lyle, SE cor. Section 24-51-101, is drilling at 2,724 feet. The Enalpac Oil Co.'s No. 2 Pauline, SW cor. SE Section 5-51-100, is drilling at 2,082 feet and its No. 1 Western States, NE SW Section 30-51-100, at 2,532 feet. Ross & Richards' No. 1, Section 28-52-101, is drilling at 635 feet.

The Honolulu Consolidated Oil Corp. is moving material for No. 1 Pitchfork, NW Section 14-48-102, on the Pitchfork structure in Park County, for a joint test with the Producers & Refiners Corp. The Ohio Oil Co.'s No. 1 Pulley, Section 27-52-101, Shoshone anticline, is drilling at 3,690 feet in the red beds.

Salt Creek

One completion in Salt Creek was reported, the Midwest and Wyoming Associated Oil companies' No. 4-A, SE Section 36-40-79, at 1,468 feet with an initial production of 60 bbls. The Teapot Consolidated Oil Co.'s No. 1 Beaton, NE Section 2-38-78, northeast of Teapot, made 200 bbls. first 24 hours from a total depth of 2,666 feet. There was considerable accumulated oil in the hole when pumping commenced and it is expected to settle to around 100 bbls.

Southern Natrona County is coming in for a considerable play as a result of the recent completion of a 100 bbl. well in the Spindletop Syndicate's No. 1 Jarvis SE cor. Section 32-30-81, which opened a new pool. The same interests moved 600 feet south of No. 1 and are drilling No. 2 on the NW Section 5-29-81. This well is logging 35 feet higher than the discovery and is expected in within a few days as a good well. Casing was set at 520 feet and the Sundance is expected at around 1,000 feet. The Shoshone Consolidated Oil Co. is preparing to start a test on the Bates Park Dome, to the northeast of the Spindletop operation, probably in Section 4-30-81, and same interests with M. C. Wiseman in charge, will drill on the Alcova anticline west of Spindletop.

In southwestern Wyoming there is little to report outside of routine. The Midwest Refining Co. has announced the location for its test on the Waterfall structure in Lincoln County. The well has been spotted 330 feet from the south line and 990 feet from the east line of SW Section 35-22-115. The elevation is 7,418 feet.

In Uinta County, the California Co.'s No. 1 U. P. Section 7-17-116, Muddy Creek Structure, is drilling at 510 feet in hard brown sand. At 475-87 feet it had salt water in a pink sandy shale, rising to within 150 feet of the top. The Wilcox-Henly, Inc. No. 1, SW SE Section 3-14-118, Meridian anticline, is reported to have had 600 feet of light green oil standing in the hole from a total depth of 756 when a cave shut off the gas that accompanied the oil. Brigman and others' No. 1, Section 12-15-118, is reported drilling at 1,400 feet.

La Barge District

In the La Barge district the Wooten Oil Co.'s No. 1 Section 26, is drilling at 2,000 feet, and the Rainbow Oil Co. is rigging up for its No. 8.

In Sweetwater County, the Custer Petroleum Co.'s No. 1 Wilson, Section 24-12-100, Hiawatha Dome, being drilled by the Ohio Oil Co., is running 10-inch at 1,960 feet on top of a sand. This well had a flow of 4,000,000 feet of gas from a stray sand at 1,786-96 feet at which time boilers were moved back. The Ohio Co. has a large gas well on this structure on the Colorado side. Producers & Rediners and Marland Production Co.'s No. 1, Section 26-20-104, north Baxter Basin, is drilling at 1,015 feet.

In Carbon County, the Producers & Refiners No. 19, Section 25-26-87, Ferris Dome, is reported plugging back from a total depth of 4,600 feet. This is the well which two months ago was reported to be 2 feet into the Tensleep sand at 4,525 feet and making 25 bbls. per hour of light green oil. It was subsequently reported making 100 bbls. of oil and 100 bbls. of water. Same company's No. 24, Section 26-26-87, is still bottomed at 2,685 feet and fishing for underreamer. Same company's No. 8, Section 7-26-89, Weryz Dome, a Sundance sand test, is waiting for cement to set, the 11¾-inch outside diameter casing having been set at 3,250 feet.

In Fremont County, the Texas Production Co.'s No. 1, Section 1-33-95, Alkali Butte Dome, cemented the 8¼-inch at 3,082 feet and is waiting for cement to set, and the Producers & Refiners' No. 1, Section 34-34-92, Muskrat Dome, is fishing for bit at 3,442 feet.

In Niobrara County, the Buck Creek Oil Co.'s No. 1 Hattie Peterson, NW NW Section 30-37-62, Ant Hills Dome, is bottomed at 4,032 feet at which depth the 6¼-inch casing was run, and its No. 1 Denning, Section 4-36-62, Cow Gulch Dome, is drilling at 455 feet.

New Mexico

Gibson & Johnson's No. 1 Leek, Section 2, Block 74, Winkler County, Texas, just 3 miles south of the Lea County, New Mexico line, continued to occupy the most prominent place in the southeastern New Mexico news. Late reports from the well, which may prove a connecting link between the Winkler County and New Mexico development, are that at 3,048 feet it picked up a 4-foot saturated oil sand followed by a flow of gas estimated at 25,000,000 feet at 3,071 feet in white lime. The well is shut down at this depth waiting for orders. In Lea County the most interesting development was the Marland Production Co.'s No. 1 Eaves, SW NE Section 19-26-37, north of the Leek well in Winkler County. The Eaves well was shut down for a while at 2,843 feet following the cementing of the 10-inch at 2,840 feet. It was then reported 253 feet in the lime. Drilling was resumed last week and at 2980 feet is reported making 3,000,000 feet of sulphurous gas and boilers are being moved back. The Eaves well is 2 miles west of the Texas Production Co.'s No. 1 Rhoades well which is shut in as a gasser with some oil. The Marland Production Co.'s No. 1 Roberts, SW cor. Section 20-23-35, has cleaned up a fishing job and is drilling ahead at 1,660 feet, and its No. 1 Sholes, NW cor. SW Section 19-25-37, is drilling at 285 feet in gray sand. Same company's No. 1 Seideman, SW cor. Section 4-25-36, set the 10-inch at 1,757 feet and is drilling at 2,285 feet in salt and anhydrite. The Empire Gas & Fuel Co.'s No. 1 State, NE cor. NW Section 8-21-35, was drilling in the red beds at 740 feet, and the Gypsy Oil Co.'s No. 1 State, SW cor. Section 34-21-36, is drilling below 500 feet.

Maljamar Operations

The Maljamar Oil & Gas Co.'s No. 2 Beardsley, SE NE Section 15-17-32, is making new hole for the first time for more than a month, having been delayed by a fishing job at 4,296 feet. After failure to get tools out, the hole was shot to loosen and sidetracking commenced. The hole is now drilling at 4,313 feet in lime. This test has had several shows of oil and gas, the last at 3,890-93 feet at which depth it was estimated good for 20 bbls. The Curtis Drilling Co.'s No. 1 State, NE SW NE Section 22-18-34, is rigged and waiting for 20-inch pipe. The old hole drilled by Stoval & Neal, was bottomed at 210 feet. The C. E. Reynolds Drilling Co.'s No. 1 Anderson, C NE Section 29-13 37 (corrected) is rigged and ready to spud. The Midwest Refining Co.'s No. 1 State, NE cor. Section 9-19-38, set the 10-inch at 3,050 feet and is waiting for cement to set. Cecil Bordages' No. 1 Hughes, Section 27-19-38, is fishing for bailer at 3,020 feet.

In Eddy County, Snowden & McSweeny's No. 1 Lawrence, NW cor. Section 35-20-29, is reported to have 1,500 feet of sulphur water at 1,735 feet and is shut down. It probably will be abandoned. It cut the salt at 505-1,220 feet. Levers & Carper's No. 6 State, SW NW Section 3-18-28, is drilling below 1,555 feet. The Marland Production Co.'s No. 1 Gardner, NE SW Section 34-23-31, is held up at 990 feet

by a cave. The Texas Production Co.'s No. 1 Compton, NE cor. SE Section 9-16-31, is building rig. The Pueblo Oil Co.'s No. 2 Gessert, NE NE NW Section 1-17-31, is drilling at 300 feet in the red beds.

In Chaves County, R. T. Neal, and others' No. 1 Russell, SW NW NW Section 21-14-25, is a location. McQuigg & McQuigg's No. 1 Neis, center NW Section 7-5s-29, which has been shut down at 1,550 feet pending title adjustment, has resumed. The Arena Oil Co.'s No. 1 Wilkins, NE cor. NW Section 18-13-31, is drilling below 3,665 feet.

San Juan County

In San Juan County in the northwestern area, the Continental Oil Co.'s No. 17 Santa Fe Corp. lease, C NE Section 2-29 19, Rattlesnake Dome, is drilling below 5,005 feet. This is the deepest well drilled in that territory. It is a test to the Pennsylvanian which has never been drilled on any of the producing structures in the San Juan Basin, and upon the outcome will depend other deep testing as the well is on the top of a producing structure in the lower Cretaceous. Poole & Peeble's No. 1 Lawson, SE SE Section 9-30-11, is reported to have resumed drilling at 700 feet after having been shut down for heavier rig. Co-Ne-Mo Oil Co.'s No. 1 Viles, Section 28-29-11, in the Kutz Canon district, is drilling below 600 feet. Dyke Oil Syndicate's No. 1 Day, NW NE Section 19-30-9, in the Blanco district, has commenced spudding.

In Torrance County, the Duran Dome Oil Co.'s No. 1 Renehan, Section 31-3n-15, is reported to have lost everything aboveground except bunk houses in a fire. Last report from the well, about 3 weeks ago, was that it was shut down at 1,620 feet.

Utah

The Midwest Exploration Co.'s No. 3 Ashley Creek, NW Section 23-5-22, in Uinta County, drilled for the Utah Oil Refining Co., has been completed at 1,683 feet and rig is being torn down. After plugging back from a total depth of 2,720 feet, it was tested and made 5,500,000 feet of gas with some water. The gas is in a sand in the Morrison formation. When first encountered it flowed at the rate of 29,000,000 feet a day. The Mid-American Oil Co.'s No. 1, Section 17-43-15, on the Bloomington Dome, in Washington County, has resumed drilling with a new crew and is bottomed at around 1,500 feet in the Coconino sandstone. The Texas Production Co.'s No. 1 Shipley, Section 5-27-14, Wayne County, is still endeavoring to clear hole of tools at 2,885 feet. The Continental Oil Co.'s No. 1, Section 23-43-22, Boundary Butte Dome, in San Juan County, is bottomed at 4,000 feet. Western Venture Corp.'s No. 1 Spahr, Section 8-5s-21, Dog Valley structure, Uinta County, is drilling below 415 feet. Same company's No. 1 Krumvieda, Section 6-5-21, Vernal monocline, is drilling at 840 feet with about 35 feet to the first objective sand. The Utah Southern Oil Co.s No. 1-A John L. Shaffer, Section 36-26-20, Cane Creek Dome, Grand County, is drilling at 960 feet in red and gray sand. The Phillips Petroleum Co.'s No. 1 Schirk, Section 16-27-16, Wayne County, is drilling at 100 feet. The Midwest Exploration Co.'s No. 1 Early, Section 13-4s-6w, Duchesne County, is drilling at 4,010 feet in brown shale. It has been decided to carry this test to 4,200 feet. Original contract depth was 3,500 feet. Maud Ellen Oil Co.'s No. 1, Section 28-3s-21, Neal Dome, Uinta County, is drilling at 950 feet.

Colorado

Officials of the companies building the Amarillo-Denver pipe line inspected that project the past week. It is expected the gas will be turned into it within 30 days. Among the officials in the party were Christy Payne, a director of the Standard Oil Co. of New Jersey, and president of the Colorado Interstate Gas Co., which is building the line between Clayton, N. Mex. and Denver; W. S. Fitzpatrick, chairman of the board of the Prairie Oil & Gas Co., and chairman of the board of the Interstate company; Nelson K. Moody, president of the Prairie company; and A. R. Jones, president of the Mission Oil Co., and a member of the board of the Interstate company.

Another gas pipe line project under consideration is being promoted by D. C. Boyd, of Tulsa, who appeared before the city council of Durango, Colo., the past week and submitted a proposal to supply gas to the city for domestic purposes if given a 25-year franchise. The city council is reported in favor of the project, but it will be necessary to submit it to a vote of the people which will take probably two months. The proposed source for the gas supply is the Ute Indian reservation in northern New Mexico upon which the Producers & Refiners Corp. and the Midwest Refining Co. drilled three wells about seven years ago. The Producers & Refiners well, No. 1 Lockhart, on unsurveyed land but approximately in the NW Section 1-31-14, found the gas at 2,380 feet and tested 72,000,000 feet. The Midwest wells were both in the SW Section 36-32-14, and found the sand at 2,360 feet and made 37,000,000 feet each. All three have been capped for lack of a market.

The Midwest Refining Co., the Ohio Oil Co., the Buffalo Basin Petroleum Co., and 19 individuals were named as defendants in a suit in the District Court in Denver by the Tanberg Oil Co. of Wyoming. The suit involves title to leases on five quarter sections on the Buffalo Basin structure in Hot Springs County, Wyoming, upon which the plaintiff alleges it obtained leases on October 15, 1915, from eight Wyoming residents who had located the claims under the placer mining laws. It sets forth that the locators failed to obtain patent on the land or preferential permits under the Oil Leasing Act of February 25, 1920 but that in 1923 the Department of the Interior granted permits to others. It asks for an accounting.

Florence District

The Florence district in Fremont County, embracing the Florence and Canon City pools, the most active operation in the State in number of drilling wells had several good completions. The G. & L. Oil Co.'s No. 1 Castantino, NW SW, Section 3-19-70, near Canon City, was completed at 1,560 feet with a production of 100 bbls. the first 24 hours. The first show of oil was found at 1,320 feet and the pay at 1,530-60 feet. C. O. Dickason and Paul C. Batis' No. 1 Winheimer, N half SE SW, Section 3-19-70, was completed at 1,650 feet. It is being put on the pump and is expected to make around 100 bbls. initial. Hammond & Sheffer's No. 1 Beltramo, NW SE SE, Section 2-19-70, encountered the pay at 1,200 feet and the oil rose 250 feet the first hour. It has not yet been tested. This well is in Hell's Half Acre, an extension of the Canon City Pool. The first well brought in in this area was No. 1 Beltramo, SW SW, Section 1-19-70, completed a year ago at 1,870 feet with an initial production of 145 bbls. and still making 20 bbls. In the same vicinity, No. 1 Richwalt completed last February made 92 bbls. initial, being the only well in the Florence district that flowed naturally, having made a number of heads before being tubed. The Texas Production Co.'s No. 1 Ott, NW SW SE, Section 3-19-70, found the pay at 1,930 feet, the oil rising 700 feet and is drilling at 1,940 feet. It looks like one of the best of the recent completions. The Canon City Oil Co.'s No. 1 D. & R. G., SW SE, Section 35-18-70, is being abandoned at 2,250 feet. This makes three dry wells on the Denver & Rio Grande Western's right of way, though the last was only a short distance from a producer. The Texas Production Co.'s No. 1 Dunlop, NW SE, Section 3-19-70, is shut down at 1,360 feet for repairs, and its No. 1 Castagna, NW NW SE, Section 3-19-70, is running 8¼-inch at 1,625 feet. The Continental Oil Co.'s No. 1 Dunlop, SW SE, Section 3-19-70, is drilling at 1,340 feet, and its No. 1 Dalfior, SE NE, Section 3-19-70, is drilling at 2,250 feet with considerable oil in the hole. Same company's No. 1 Bronwell, NW SW, Section 3-19-70, has considerable oil in the hole at 2,055 feet, but is still drilling, and its No. 3 David Hall, NW SE, Section 35-18-70, is drilling at 2,445 feet. Same company's No. 1 Machetti, SW NW, Section 2-19-70, is drilling at 2,150 feet and its No. 2 Dunn, NW SE, Section 35-18-70, at 2,430 feet. Same company's No. 1 Adamic, NW NW, Section 12-19-70, was dry and abandoned at 2,730 feet southeast of the producing area near Canon City.

Iles Dome

The Iles Dome operation in Moffat County again came in for considerable attention due to several wells reaching an interesting stage. One is the Shaffer Oil & Refining Co.'s No. 205 Yarg, NW NW, Section 26-4n-92, a joint operation with the Yarg Producing & Refining Co. This is considered a key well as it is down structure and will afford important data as to the probable productive area. At 3,730 feet it drilled into a sand supposedly the first sand in the Morrison formation and found showings of oil and gas. There was more than 2,000 feet of water in the hole and it was not possible to make a test, but the bailer brought up oil from the bottom. The Dakota water was cemented off with the 8¼-inch at 3,504 feet, but after drilling had been resumed the water broke through and has been causing trouble. The 6¼-inch was run and mudding has been attempted several times. Upon reaching the sand and finding the shows, operations were suspended for orders and it is possible the 6¼-inch will be set and cemented before any further drilling. The well is half a mile southeast of No. 21-SD Parkinson, the discovery well in the Sundance sand, and about 3 miles south of the Texas Production Co.'s No. 17 State and Alliance Oil Co.'s No. 1 Milliken which are testing the north side. The Yarg well is approximately 350 feet lower than the Texas Production Co.'s No. 17 Parkinson, the lowest on structure and 600 feet lower than the discovery well. If it should come in as a producer it will prove more than 1,000 acres. The Texas Production Co.'s No. 17 State, SW NW SE, Section 15-4-92, joint with the Kinney-Coastal Oil Co., is drilling at 3,455 feet. It topped the Frontier at 2,720 feet, 3,648 feet above sea level. This test is on a structural contour 50 feet higher than No. 205 Yarg. The Alliance Oil Co.'s No. 1 Milliken, SW cor., Section 14-4-92, east of No. 17 State and approximately 100 feet lower, cut the Frontier at 2,670-2,772 feet and found it dry and is drilling at 2,952 feet. The absence of water in the Frontier in this well and one or two other wells drilled on the north side has a tendency to confirm the opinion that the north side is a faulted zone. The Texas Production Co.'s No. 6 Parkinson, NW NW Section 23-4-92, is bottomed at 3,010 feet and underreaming at 2,988 feet. Same company's No. 13 Parkinson, NE SW, Section 22-4-92, is drilling at 3,138 feet. The Midwest Refining Co.'s No. 7-SD Parkinson, NW NW, Section 23-4-92, is drilling in benonite at 2,945 feet, and its No. 8-SD-2 Parkinson, NW NW, Section 23-4-92, is drilling at 2,745 feet in cavey blue shale. Same company's No. 33-SD Parkinson, SW SE, Section 22-4-92, is standing cemented at 2,703 feet at which 10-inch was set. Same company's No. 4-M Shaw, NW NE, Section 27-4-92, is fishing for bit at 3,820 feet.

Routt County

In Routt County, the Texas Production Co.'s No. 4 Belle Dennis, NE SE Section 7-6n-86, Tow Creek Dome, is

(Continued on Page 102)

THIRD GOOD IMPERIAL WELL IN THE TURNER VALLEY DISTRICT

By Victor Lauriston

Staff Correspondent, Canadian Fields

CHATHAM, Ontario, May 5.—In the Turner Valley Field southwest of Calgary, Royalite Oil Co.'s No 8 LSD 9, Section 12 20-3w5, has come in a big crude naphtha producer from the Madison lime horizon at 3,753 feet, or approximately 80 feet in the lime. The well is reported making around 17,000,000 feet of wet gas, with a partial crude naphtha recovery amounting to 250 bbls. a day. Within 12 hours after it blew in it had been hooked to one separator and was producing steadily on the pipe line. When production clears it will probably be connected with a second separator, when it is expected to make considerably more than the present 250 bbls. Royalite's No. 8 is about a half mile south and east of the Illinois-Alberta's No. 1 producer, and got its production at almost the same depth as Royalite's No. 4. Unlike most of the deep lime wells, No. 8 has shown no signs of freezing.

This is the third big well drilled by the Imperial Oil, Ltd. subsidiaries in the Turner Valley, its predecessors being Royalite's No. 4, drilled in October, 1924, with a daily production of 603 bbls., and Dalhousie's No. 1, brought in a couple of months ago, at present maintaining its initial production of around 260 bbls., with prospects that this will be increased when a second separator is installed. Dalhousie's No. 1 is making around 19,000,000 feet of wet gas, and has had no further trouble with freezing. It is still on the one separator.

The rotary outfit from Royalite's No. 8 will be moved to a new location for another Royalite test.

Foothills Oil & Gas Co.'s No. 2, LSD 8, Section 1-20-3w5, has a light crude production in the Blairmore-Dakota at 2,842 feet, and is running tubing. The production is estimated around 60 bbls. a day, and the well will be given a definite production test at this depth, though when the shallow production falls off, the hole will likely be continued to the deep lime. Foothills' No. 1, SW, Section 26-20-3w5, which had been carried to 3,498 feet, is being redrilled at 3,496 feet.

Royalite Oil Co.'s No. 6, LSD 16, Section 31 10-2w5, is at 4,303 feet with 4½-inch casing cemented. This well is on top of the lime and should get production in 100 feet more. Royalite's No. 9, LSD 6, Section 13-20-3w5, is at 4,085 feet and making up pipe. Royalite's No. 11, LSD 10, Section 12-20-3w5, is drilling at 2,402 feet. Royalite's No. 13, LSD 6, Section 12-20-3w5, is at 358 feet and drilling. Royalite's No. 15, LSD 1, Section 12-20-3w5, is drilling at 1,512 feet. Royalite's No. 16, LSD 2, Section 12-20-3w5, is drilling at 1,316 feet.

Dalhousie Oil Co.'s No. 6, LSD 10, Section 13-20-3w5, is at 4,901 feet and drilling. Home Oil Co.'s No. 2, LSD 14, Section 20-19-2w5, is at 4,405 feet and drilling. Home's No. 3, same LSD, is drilling at 290 feet.

To Drill Deep Lime

New McDougall-Segur Oil Co.'s No. 2, which has been producing from the Blairmore-Dakota at 2,646 feet, is getting in shape to drill to the deep lime. About 1,500 feet of drilling will be required to reach the deep production; the New McDougall-Segur lease is close to a number of deep producers. Drilling will be carried on simultaneously at No. 2 deep test and No. 3, same LSD, which is a test of the Blairmore-Dakota horizon and has just finished cementing 10-inch casing at 1,900 feet. No. 2 well had a production of about 39 bbls. a day of light crude from the Blairmore horizon. No. 1 well is making 33 bbls. a day from the same sand.

Illinois-Alberta's No. 1, LSD 14, Section 12-20-3w5, is making 95 bbls. a day from the deep lime.

British Dominion Oil Development

(Continued on Page 178)

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FOR CRUDE OIL, GAS, WATER, SEWAGE, COMPRESSED AIR, ETC

Light Crude Premium in California

Upward Revision Expected When Long Beach Reaches Peak, Probably Within 30 Days. No Change Likely in Heavy

By L. P. Stockman
Staff Correspondent, California Fields

LOS ANGELES, Calif., May 5.—The constant decline in stocks of naphtha distillates and refining crude on the Pacific Coast during the past few years has begun to manifest itself in the payment of substantial bonuses for light refining crude and while this practice was started several months ago by a number of relatively small independent refiners it is common knowledge at least one of the major companies has also resorted to the paying of premiums for crude oil contracts. Up to the present this competition for crude oil has been limited almost entirely to the Long Beach Field but reports emanating from other districts during the past week indicate this practice has also recently extended into other areas. For several months independent refiners have been offering a premium of 10 cents per barrel in excess of the Standard's posted price for crude at the well but one of the larger companies boosted this to 15 cents per barrel within the past few weeks and it is now almost impossible to make any kind of a crude oil purchase contract without offering the producer some kind of a substantial inducement and in many cases operators having drilling wells will not sign up at any price as they hope to get an even larger bonus within a month or two.

Crude oil brokers have sprung up like wild flowers in the spring during the past few months and at the present rate they will be selling crude oil to one another like liquor bootleggers unless a halt is called to this practice in the very near future. The cause of this uniformity of prices is due to the unusually large spread between the price of crude and refined oils and a substantial raise in the posted price for light refining crude seems to be about the only remedy. The lower zone now under intensive development at Long Beach yields an excellent light crude averaging approximately 30 degrees A.P.I., the posted price of which is $1 per barrel. The prevailing 15-cent bonus brings this up to $1.15 per barrel and one independent refiner with a low overhead and satisfactory marketing conditions informed the writer this morning that he was netting a little less than 25 cents for each barrel of crude handled, notwithstanding he was paying a premium of 15 cents per barrel above the Standard's posted price.

Long Beach Crude

Long Beach crude resulting from the deep zone exploitation yields roughly about 12 gallons of gasoline which should net a conservative independent refiner something like 9 cents per gallon after paying the state tax of 3 cents and deducting operating costs, evaporation and refinery losses, delivery charges and reseller's differential This does not represent the total net, however, as most independent refiners use a heavy natural gas gasoline blend, each gallon of which used brings in a profit as this commodity is purchased at 6 and 7 cents per gallon and passed on to the reseller in the blend at from 8 to 9 cents. The fuel oil and other by-products resulting from refinery operation are disposed of at approximately 1 cent per gallon or dumped on the market for what they will bring as it is especially necessary to keep the fuel oil moving to prevent a large accumulation which obviously precludes economic operation and ties up necessary working capital. The independent cut-throat refiner does not work on as favorable a basis as that covering the operations just mentioned and consequently puts out a very much inferior product by cutting deep into the crude and fortifying this gasoline with a very high casinghead blend.

It is a foregone conclusion that prices of both crude and refined oils would have been raised over a month ago if the major refiners could have disposed of current production of heavy crude and refinery residuum but the consistent accumulation of heavy crude has practically prevented any price readjustment. California refiners have been drawing on stocks of light refining crude for more than a year and it is quite possible an upward revision may be made covering light crude and refined oils in the very near future as there is ample justification for such a procedure, especially as only a limited amount of light oil has been curtailed. The heavy oil shut in does not have any direct bearing on the gasoline situation and no objection could be raised from this angle. No attempt has been made to curtail the production of light refining crude as the demand for this product exceeds the supply, bringing a premium in many instances. The pinching in of 11,500 bbls. per day of light refining crude at Ventura Avenue is a conservation measure instituted primarily to conserve natural gas resources.

Advance Expected

The local price structure is a very complex one, and while present conditions appear to justify the expectation of higher prices for light crude and refined products in the very near future, offshore shipments of gasoline and keen competition locally may temporarily retard the advent of this period. It must come eventually, however, and those in close touch with the present situation anticipate an upward revision as soon as Long Beach goes over the top, which will probably occur within 30 days. A probable boost of 25 cents per barrel in the price of light refinable crude and a 1 or 2-cent raise in gasoline in the near future looks like a good bet but it is not likely any change will be posted on heavy crude. The premiums being offered for Long Beach crude will probably go a long way toward forcing an upward revision of present quotations as the major companies adhering to regular posted prices are unable to negotiate new contracts because of the bonuses being paid by independent refiners.

The prevailing bonus is approximately 15 cents per barrel for 30 gravity crude but one contract was recently signed at 30 cents per barrel above the present posted price, this premium to continue until crude is raised, when the bonus will be automatically reduced to 15 cents per barrel. Local producers are highly optimistic over the outlook and this feeling seems to be getting general as most of the fields now under development are being held back and will not upset the apple cart again unless some one kicks over the traces and precipitates another intensive drilling campaign. This could happen in several fields if some one made a slip, as dormant deep zones at Inglewood, Coyote, Dominguez, Seal Beach and new potential horizons at Santa Fe Springs, Rosecrans and Richfield could cause a lot of trouble if one or more was developed simultaneously. The industry seems to have learned its lesson, however, and this work will probably be held in abeyance until a more opportune time.

Gas Conservation

The California Operators General Committee on Gas Conservation, appointed several months ago by E. W. Clark, pres-

(Continued on Page 173)

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, Well, Location—	S-T-R	Depth	Status
World Pet. Co., No. 1 Inglewood, Los Angeles Co.	26- 1-12	3,772	suspended
Mont. Park Oil Co., No. 1 Browning, Monterey Park	26- 1-12	4,530	set pipe
Shell, No. 2 Mission, San Fernando	4- 2-15	1,400	hd. sd. drilling
Andrews, Otis, No. 1 Lancaster, Los Angeles Co.	23- 8-13	2,120	hd. sd. drilling
Woods, D. H., No. 1 Lancaster, Los Angeles Co.	5- 7-10	Rig	suspended
Security Pet. Co., No. 1 Lynwood, Los Angeles Co.	13- 3-13	4,912	hd. sd. drilling
Dominguez Ext., No. 1 Compton, Los Angeles Co.	27- 3-13	5,510	pipe trouble
San Clemente Oil Co., No. 1 Peck, Hawthorne	20- 3-14	5,765	to deepen
Easton & Smith, No. 1 Calabasas, Los Angeles Co.	19- 1-17	1,103	hd. sd. drilling
Scott & Currier, No. 1 Hawthorne, Los Angeles Co.	33- 3-14	140	suspended
White Behr, No. 1 Watson, Los Angeles Co.	21- 4-14	5,300	sd. sh. drilling
Buttrum, F. W., No. 1 Richfield, Orange Co.	36- 3- 9	4,552	hd. sd. drilling
Ohio Oil Co., No. 1 Anaheim, Orange Co.	9- 4-11	5,560	hd. sd. drilling
The Texas Company, No. 1 Santa Ana, Orange Co.	34- 4-10	.....	location
Prairie Oil & Gas, No. 1 Westminster, Orange Co.	13- 5-11	1,711	hd. sd. drilling
Kneuper, A. D., No. 1 Seal Beach, Orange Co.	10- 5-12	Rig	suspended
Getty, Geo. F., No. 1 Seal Beach, Orange Co.	14- 5-12	5,530	suspended
Shell, No. 1 Stern, Orange Co.	22- 3-10	5,090	hd. sd. drilling
Hemet Pet. Co., No. 1 Ward, Riverside Co.	9- 5- 1	2,712	hd. sd. drilling
Mesa Pet., No. 1 Newport, Orange Co.	21- 6-10	2,980	suspended
Davenport O. & G. Co., No. 1 San Marcos, San Diego Co.	30-12- 2	450	hd. sd. drilling
Turner, S. S., No. 1 Escondido, San Diego Co.	25-12- 2	615	hd. sd. drilling

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Bolsa Chica, No. 1 Kettleman, Kings Co.	30-23-19	3,502	suspended
General Pet., No. 2 Ochsner, Kettleman Hills	28-22-18	6,755	suspended
South Coalinga, Well No. 1 Kettleman Hills	35-24-19	3,110	suspended
Monocline Dev. Co., Well No. 1 Kettleman Hills	7-21-21	4,308	suspended
McPhail, Hugh, Well No. 1, Kettleman Hills	13-24-18	2,100	suspended
Milham Expltn., No. 1 Kettleman, Kings Co.	2-22-17	7,236	fishing
Star Petroleum, No. 2 Canet, Ventura Co.	13- 3-23	5,975	hd. sd. drilling
Standard, No. 6 Saticoy, Ventura Co.	10- 2-22	260	survey hole
California Western Oil Co., No. 1 Elkins, Ventura Co.	5- 3-19	2,270	hd. sd. drilling
Exline, Emma, No. 1 Saticoy, Ventura Co.	33- 3-21	1,501	sd. sh. drilling
Petroleum Sec., No. 1 Diablo, Ventura Co.	26- 5-18	4,563	testing
Parkford, E. A., No. 1 Strathern, Ventura Co.	5- 2-18	4,002	suspended
Shell, No. 1 Strathern, Ventura Co.	6- 2-18	4,735	hd. sd. drilling
American Oil Co., No. 1 Camarillo, Ventura Co.	33- 2-20	175	suspended
Hackworth, J. W., No. 1 Ojai, Ventura Co.	11- 4-23	2,311	hd. sd. drilling
Scott Pet. Co., No. 1 Rincon, Ventura Co.	35- 4-25	3,895	recemented
Shell, No. 3 Grubb, Ventura Co.	26- 2-22	711	sd. drilling
Shell, No. 1 Sno lgrass, Ventura Co.	23- 2-22	1,430	abandoned
Shell, No. 2 Berlywood, Moorpark	32- 3-20	7,184	reaming
Continental, No. 1 Sulphur Mountain, Ventura Co.	21- 4-22	110	sd. drilling
Miley Oil Co., No. 1 Red Mountain, Ventura Co.	7- 3-25	980	suspended
Milham Expltn., No. 1-A Buttonwillow, Kern Co.	8-28-23	4,662	gas well
Milham Expltn., No. 2 Buttonwillow, Kern Co.	8-28-23	2,730	gas well
Milham Expltn., No. 3 Buttonwillow, Kern Co.	8-28-23	2,694	gas well
Milham Expltn., No. 4 Buttonwillow, Kern Co.	5-28-25	2,670	gas well
Milham Expltn., No. 5 Buttonwillow, Kern Co.	5-28-23	457	sd. drilling
Doheney-Stone, No. 1 Salisbury, Kern Co.	7-29-24	4,291	hd. sd. drilling
Southern Calif. Gas Co., No. 1 Buttonwillow, Kern Co.	4-28-23	2,830	testing
Southern Calif. Gas Co., No. 2 Buttonwillow, Kern Co.	10-28-23	Mtl.	building rig
Richfield Oil Co., No. 1 Semitropic, Kern Co.	21-26-22	1,620	suspended
Pacific Eastern, No. 1 Union Ave, Kern Co.	6-30-28	5,640	suspended
Pacific Eastern, No. 2 Union Ave., Kern Co.	6-30-28	4,500	reaming
Pacific Eastern, No. 3 Union Ave., Kern Co.	6-30-28	.....	location
Jackson & Chamberlain, No. 1 Bakersfield, Kern Co.	19-29-28	601	sd. sh. drilling
O'Donnell, J. E., No. 1 Greenfield, Kern Co.	31-30-28	3,712	hd. sd. drilling
The Texas Company, No. 1 Arvin, Kern Co.	22-31-29	.....	location
Stabler, W. W., No. 1 Comanche Point, Kern Co.	23-32-29	2,400	sd. sh. drilling
Midway Northern, No. 1 Edison, Kern Co.	29-29-30	3,340	hd. sd. drilling
North American, No. 1-A Delano, Kern Co.	5-25-26	5,570	hd. sd. drilling
General Pet., No. 1 McFarland, Kern Co.	35-25-25	Mtl.	building rig
McVey, Max, No. 1 Shafter, Kern Co.	8-28-25	Rig	rigging up
Fresno Madera Oil Co., No. 1 Clovis, Fresno	18-27-21	4,066	suspended
Texas Pacific, No. 1 Brown, San Luis Obispo	22-32-14	2,420	hd. sd. drilling
Richfield, No. 1 Wreden, San Luis Obispo Co.	10-29-17	3,130	suspended
Richfield, No. 1 Carissa, San Luis Obispo Co.	15-29-17	3,711	hd. sd. drilling
Union Oil Co., No. 1 Huasna, San Luis Obispo Co.	34-32-15	2 203	hd. sd. drilling
San Luis Syndicate, Well No. 1, San Luis Obispo Co.	29-31-15	2,901	sd. sh. drilling
Sequoia Oil Co., Well No. 1 San Mateo Co.	13- 7- 5	1,515	hd. sd. drilling
Shell, No. 1 Cowell, San Mateo Co.	8- 6- 5	5,906	to abandon
Shell, No. 2 Cowell, San Mateo Co.	8- 6- 5	310	sd. drilling
Shell, No. 1 Butts, San Mateo Co.	16- 6- 5	2,584	fishing
Shell, No. 1 Mosel, Petaluma	8- 5- 6	1,810	hd. sd. drilling
R. Y. Hanlyn, Well No. 1, Alameda Co.	3- 5- 2	782	sd. drilling
Thomas & Hammill, Well No. 1, Alameda Co.	16- 3- 3	1,070	water trouble
Tepesquit Oil Co., Well No. 1, Santa Barbara Co.	3- 9-32	1,970	hd. sd. drlng
Becker, Geo. F., No. 1 Summerland, Santa Barbara Co.	33- 4-25	3,045	testing
Twin State Oil Co., No. 1 Modoc, Santa Barbara Co.	20- 4-27	3,750	hd. sd. drilling
Fort Wayne Synd., No. 1-A Goodcell, Madera Co.	22-10-17	Rig	suspended
Continental Oil Co., No. 2 Smith, Colusa Co.	31-18- 4	4,300	cleaning out
Colus Oil Co., Well No. 1 Colusa Co.	3-15- 4	380	hd. sd. drilling
Nuna Oil Co., Well No. 1 Colusa Co.	19-15- 4	348	sd. drilling
Superior Oil Co., No. 1 Calivada, Colusa Co.	31-15- 4	320	sd. drilling
Marland Oil Co., No. 1 Bradley, Monterey Co.	32-24-11	2,180	fishing
North Counties Oil Co., Well No. 2 Humboldt Co.	36- 2- 1	2,110	hd. sd. drilling
Humboldt Oil Co., Well No. 1 Humboldt Co.	6- 2- 1	3,035	hd. sd. drilling
Tuck, J. W., Well No. 1, Santa Clara Co.	9- 8- 1	300	sd. sh. drilling

TANKER SHIPMENTS FROM LOS ANGELES TO ATLANTIC AND GULF COAST PORTS

Commodity—	Total This Week	Daily Average	Total Last Week	Daily Average	This Year to Date	Same Time Last Year
Crude oil	175,406	25,058	.....	.....	2,034,667	2,619,798
Fuel oil	.....	.....	.....	.....	.....	3,196,798
Diesel and gas oil	75,989	10,856	95,024	13,575	757,927	1,386,653
Gasoline	230,927	32,990	213,198	30,457	3,652,239	2,649,621
Coastwise—						
Crude oil	626,794	89,542	476,109	68,016	6,407,781	9,764,227
Fuel oil	299,670	42,810	416,539	59,506	6,410,018	4,767,957
Diesel and gas oil	46,020	6,574	78,950	11,279	478,722	95,603
Gasoline	236,892	33,842	134,168	19,167	4,018,641	2,983,991
Kerosene	.....	.....	.....	.....	24,415	45,068
Tops	.....	.....	.....	.....	171,566	.....
Exports—						
Crude oil	67,816	9,688	70,900	10,129	812,042	1,400,029
Fuel oil	450,404	64,343	476,866	68,124	8,640,952	10,136,307
Diesel and gas oil	30,614	4,373	50,010	7,144	955,972	477,513
Gasoline	69,512	9,930	70,475	10,068	1,606,135	937,134
Tops	.....	.....	.....	.....	.....	227,204
Kerosene	180,817	25,831	.....	.....	1,710,736	1,010,174

TANKER SHIPMENTS FROM SAN FRANCISCO TO ATLANTIC, GULF COAST PORTS

Diesel and gas oil	.....	.....	.....	.....	342,425	415,555
Gasoline	.....	.....	174,772	24,967	813,509	890,088
Lubricants	.....	.....	.....	.....	138,769	111,970
Coastwise—						
Fuel oil	174,321	24,903	77,859	11,123	1,349,187	2,116,946
Diesel and gas oil	10,093	1,442	.....	.....	108,529	173,724
Gasoline	83,633	11,948	234,089	33,441	1,313,604	1,865,849
Kerosene	4,923	703	2,417	345	80,563	75,161
Exports—						
Crude oil	.....	.....	.....	.....	25,029	.....
Fuel oil	70,461	10,066	75,310	10,773	800,623	793,179
Diesel and gas oil	.....	.....	.....	.....	10,400	.....
Gasoline	12,582	1,798	162,933	23,278	1,450,027	1,368,702
Kerosene	.....	.....	.....	.....	307,089	510,187
Lubricants	.....	.....	.....	.....	.....	9,120

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Executive Offices & Main Plant, Parkersburg, W. Va., U. S. A.

Run 100 Strings in Western Kentucky

Wildcat in Union County Develops Gas Production. Production From Ohio and Daviess Counties Growing

By Whit
Staff Correspondent, Kentucky-Tennessee

OWENSBORO, Ky., May 7.—Development work is getting more active in the western division of Kentucky, as there are close around 100 strings of tools running in Ohio, Daviess, McLean, Hancock, Breckenridge, Webster, Henderson, Union and other nearby counties and with better weather conditions and dry roads many additional drilling outfits will be shipped into the field as lease holders are anxious to test out their holdings. Wildcatting appears to be the order of the day at this time. Dry holes are found in close proximity to some of the best producing wells in Ohio and Daviess Counties, which is nothing new in any area of Kentucky.

The best of the late completions were developed in the Ambrose Pool, in Ohio County, where No. 4 on the Lake Ambrose lease, with an initial of 150 bbls. and Nos. 11, 12 and 13 on the Bartlett heirs are rated at 100 bbls. initially each. Daviess County is also credited with two wells out of the ordinary in No. 2 on the Tompkins land in the Brown Pool, estimated at 150 bbls. initially and No. 2 on the Fields lease, in the Hayden Pool, same county, good for 120 bbls. initially.

A wildcat drilled in the Spring Grove area of Union County developed into a nice gas producer from a shallow pay sand at a depth of 628 feet, although the venture may be drilled to the deeper sands, otherwise it may be used for light and heat in Morgansfield and some of the close-by towns of the county.

Eastern Kentucky failed to register any new completions since the last review of that field. This part of the State is always backward in starting new work during the spring season owing to the high waters that prevail there.

River Transportation

The Illinois Pipe Line Co. has shipped its first crude from the western Kentucky Field, by water. It required six hours to fill the 5,000-bbl. oil tanker at its barge on the river front at Owensboro and head it back to Louisville for the Aetna Refining Co., of that city. It took about 11 hours for the empty barge to come downstream, but required 36 hours to return because of the heavy current against it and the depth the barge was sitting in the water. The barge settled down 7 feet from the time oil began to flow in until it was filled. A weight of 150,000 pounds had been loaded which is carried by the barge's own power, not requiring a towboat to take it back to Louisville. From now on many barges of crude will be shipped in this manner to Louisville refineries by both the Illinois Pipe Line Co., and the recently completed pipe line of the James C. Ellis interests.

Week's Work

A summary of the week's work in the Kentucky fields shows 25 completions, 14 producers with an initial production of 910 bbls., 9 dry holes and 1 gas well.

County—	Oil Comp.	Wells	Prod.	Dry	Gas
Ohio	12	9	575	3	0
Daviess	10	4	315	5	1
Hancock	1	1	20	0	0
Union	1	0	0	0	1
Allen	1	0	0	1	0
Total	25	14	910	9	2

Western Kentucky

Production is gradually increasing in the western division of Kentucky and its output is now on a par with the eastern division. The big output comes from Ohio County, although Daviess County production is increasing rapidly. During March, the Ohio County output totaled 158,606.76 bbls., against 147,458.30 bbls. for February, a gain of 11,148.46 bbls. Daviess County's production for March amounted to 19,483.30 bbls. against the February figures of 5,326.82 bbls., a gain of 14,156.48 bbls. Hancock County, for March did 1,923.45 bbls. against 1,312.32 bbls. for February, a gain of 611.13 bbls. McLean County's production for March was 347.76 bbls., and for February, 159.68 bbls.; a gain of 188.08 bbls., making a total production for the four counties for March of 180,361.27 bbls. against the February production of 154,257.79 bbls., a gain of 26,104.15 bbls. These figures were reported by the State of Kentucky.

Ohio County Wells

The best completion reported from the Ohio County fields, since the last review of operations was made by the Rex-Pyramid Oil Co. in its No. 4 on the Lake-Ambrose farm, in the Ambrose Pool, which had an initial production of 150 bbls.

The Creek Drilling Co.'s Nos. 11, 12 and 13, on the Bartlett heirs' 81 acres in the same pool are reported good for an initial production of 100 bbls. each.

In the same pool, the Woods Oil Co.'s Nos. 27 and 28, on the Mary J. Elmore 100 acres, showed initial production of 30 and 50 bbls. This lease is in the heart of the rich pool and has developed some wonderful producers. Same company drilled a dry hole in No. 6 on the J. C. Smith 151 acres, in the Sunnydale Field, at 663 feet and one of the same kind in the same pool, on the W. A. Taylor 180 acres, at a depth of 761 feet.

Whitesville Oil Co.'s No. 4, on the Mary C. Askins 56 acres, near Collier, set a string o 472 feet of casing, found sand at from 497 to 510 feet and went to a total depth of 513 feet and shot with 5 quarts, the well pumping 10 bbls. initially.

South of the Askins farm, W. H. Ford's No. 3, on the Holbrook-Wells 50-acre farm, proved a dry hole at a depth of 511 feet. This well is between the hamlet of Collier and the Burk School house.

The Ohio Oil Co.'s No. 1 Ray Rhodes, near Aetnaville, is a light producer estimated as only a small pumper. Leeper Oil Co.'s last well on the McKinley farm, is reported showing for 20 bbls.

Daviess County

Miller & Damron's No. 2, on the J. W. (Dutch) Tompkins farm, close to the good producer on the Mahloskey farm, in the Brown Pool, near Utica in Daviess County, is among the best showings so far in that area. The well is said to show for 150 bbls. or better, being similar to the well on the Brown farm.

The next best well of the late completions is the U. S. & W. Oil Syndicate's No. 2, on the C. M. Fields farm, in the Hayden Pool, with an initial of 120 bbls.

Weideman Oil Co.'s No. 1, on the Steve Simon farm, in the Red Hill area, proved a duster.

Cumberland Petroleum Co.'s No. 1 Robert H. Neeley farm, in the Hayden Pool, is being fixed up as a gas producer, reported showing around 2,000,000 feet, at 1,273 feet.

L. C. Young's test on the R. L. Sands farm, in the Red Hill district, is a dry hole, at a depth of 935 feet.

In the new Jones Pool, some 3 miles or so west of Whitesville, the Ohio Oil Co.'s No. 1, on the Burton heirs' farm, adjoining the Jones farm, is rated good for 20 bbls.

A. G. Brooks and others' test on the Rev. C. F. Hartford farm, near Grayville School, was drilled to a total depth of 1,050 feet. There being only a slight showing of oil, it has been listed with the dry holes.

Jolly & Howard's test on the West Riddle farm, between the Hayden and Brown Pools, and 1½ miles southeast of the dry hole on the Stephens farm, also a duster.

Cumberland Petroleum Co. drilled a dry hole on the J. L. Gray farm, which Bert Thompson's test in the northwest corner of the Harvey Asher farm was also in the dry list.

Leeper Oil Co.'s No. 4 well, 600 feet from the north line and 200 feet from the west line of the W. L. Barnett 3 acres, is reported with an initial of 2 bbls.

Other Completions

In the Gainesboro area of Allen County, Stumbo and Stumbo's No. 5, on the Levi Hinton farm, was dry at a depth of 300 feet.

In the Pellville Field of Hancock County, Dave Duncan and others, local people of the county, and mostly from Hawesville, have what shows for a 20-bbl. pumper on the Leo Rosenblatt property, near the division line of Hancock and Daviess Counties.

A wildcat drilled by W. R. Abbott and others on the W. C. Riggs farm, in the Spring Grove area, about 4½ miles west of Morgansfield, in Union County, struck a heavy gas volume at a shallow depth of 628 feet.

Field News

North of Knottsville, in Daviess County, and west of Pellville, the Kipp Oil Co.'s No. 6, on the Mattingley heirs' farm, is making a showing for one of the best on the lease. There are five pumping wells on this lease at this time.

The Eastern Gulf Oil Co. is about ready for completion of its No. 2 on the Murray lease, in the Hayden Pool, in Daviess County, and moving to a new location for a test on the Ridgeway farm, an offset to the good well on the Fields farm, owned by the Weideman Oil Co., also located in the Hayden Pool. E. C. Dyer, manager of the Eastern Gulf Oil Co., has returned to Owensboro, from his home in Lexington, where he has been confined to his home with flu for several days.

Because of the distance of the Brown and Hayden Pools from the main line of the Illinois Pipe Line Co. it will become necessary for the Illinois Pipe Line Co. to build a pumping station for that section, but this depends largely on the increase in production in the two pools.

Brooks & Chenault got a light showing of oil in a wildcat on the R. R. Kelly farm, near the Friendsville School section of Ohio County.

The Interstate Oil Co. has rented offices in the Soaper Hotel at Henderson, with H. A. Moore in charge. Dr. S. C. Long of Evansville, Ind., is president of the company, which has a large acreage under lease in Henderson, Webster and Union Counties. The company has a well under way in Webster County, near the town of Robards, just over the Henderson County line.

The well drilling by the Wabash Drilling Co., on the Massie farm in Ohio County, about 4 miles east of the town of Buford and west of the Ambrose Pool, has been delayed by a fishing job around 650 feet.

Hopkins County is now one of the active spots. Leasing is being done in the vicinity of Ashbyburg and Vandetta. Leases on 6,659 acres have been left for record at Madisonville, the county seat. The past several weeks there have been close to 20,000 acres leased in the county

TRENTON ROCK WELL IN SENECA LARGEST IN CENTRAL WEST FIELD

By Whit
Staff Correspondent, Central West Fields

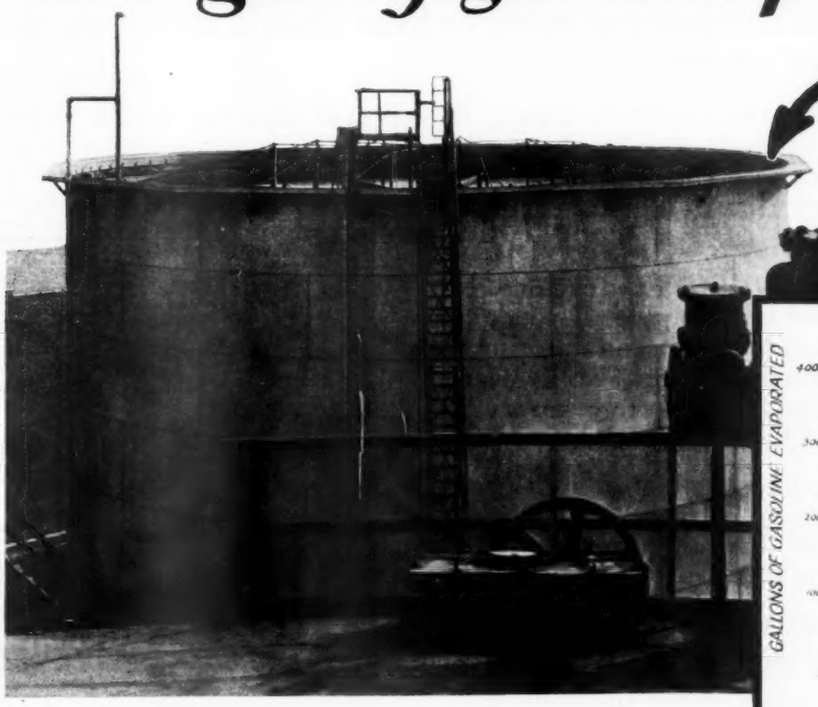
FINDLAY, Ohio, May 7.—Another quiet week in completed work comes from the Central West, there being but 16 completions reported from the four divisions, of which 5 were dry holes, 6 gas wells and a new initial production of 635 bbls. from 5 oil wells.

The big well drilled by J. H. Murphy & Son, No. 1 in southeast corner of John Swartzmiller farm, in the NW of Section 28, Liberty Township, Seneca County, north of Tiffin and between Bettsville and Bascom and almost direct east of Fostoria, struck the top of the Trenton at 1,350 feet and drilled 154 feet in the sand to a total depth of 1,504 feet, there being a little salt water encountered, not enough to spoil the oil but just put it a little off color. It was connected up at once by the Buckeye Pipe Line Co., and the first 24 hours amounted to 400 bbls., which flowed into tankage, there being two 100 and one 250-bbl. tanks, thence into the pipe line. Nearly every acre in Liberty Township has been taken under lease and the territory will be given a most thorough testing. One feature of this area is that the wells maintain a good production for a long period. No. 2 of the same company on the David M. Hunker farm, Section 21, same township, drilled in around a year ago and starting at 30 bbls. initial, increased its production to 75 bbls. within six weeks after its completion, and it is now reported doing from 50 to 75 bbls. regularly daily, making it one of the best wells in the field until some of the recent completions were made, and when the late wells are a year old they probably will not show the output that No. 3 Hunker is making at this time. Some excellent producing wells have been uncovered in the vicinity of the gusher. No. 1 on the Joseph Sentelbatch farm, Section 28, completed during April, showed an initial of 80 bbls., while in March the Murray Valley Oil & Gas Co.'s No. 1 on Jacom Kimmert farm, in the NW of Section 28, showed a natural initial production of 70 bbls., and is reported holding close around 50 bbls. daily, while J. H. Murphy & Sons No. 3 on the Griffith Leister farm, in the SW of Section 20, same township, finished in March, started with a production of 20 bbls. and is doing close to that amount at this time. It is the size and staying qualities of the wells that interest the operator most and for that reason many have secured acreage in the township in hopes of duplicating some of the wells mentioned. A test drilled in Section 29, same township, on the Dora Brubaker farm, did not prove a producer, a dry hole discouraging those holding leases close up to the failure.

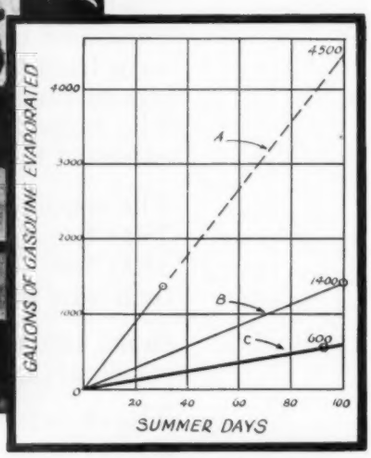
In the North Baltimore Field, Henry Township, Wood County, the Ohio Oil Co. abandoned No. 19 on the David F. Biehler farm, Section 14, and in Plain Township, same county, Hulse & Kundtz,

(Continued on Page 166)

A 7/8 inch adjustment right HERE saves 39 gal. of gasoline per day



60 ft. Wiggins Floating roof on working tank in eastern refinery.



Comparison of losses on Wiggins Roofs when seal is varied as to efficiency. 63° A.P.I. Gasoline under a 50-ft. Wiggins Roof.

One of the surest ways to prove the effectiveness of the Wiggins principle of sealing the space between the floating deck and the tank shell is to violate this principle. The close fit of the roof shoes to the tank shell only needs to be changed slightly to produce a surprising effect.

When the tall narrow slot is opened only an extra ¼ in. the evaporation from a 50-ft. diameter tank immediately increases from about 6 gal. to about 14 gal. per day. If the shoes are held away from the tank an extra ⅞ in., the loss jumps up to 45 gal.

It is obvious that no vapor can escape through the steel deck of a floating roof. But no floating deck can fit the tank shell airtight. Therefore, the all important feature of the floating roof is the means used for sealing this space. Experience verifies tests similar to the one cited above showing that the Wiggins principle—the tall narrow slot—eliminates evaporation almost completely in this annular space.

That's why Wiggins Floating Roofs are making such enormous savings on a wide variety of applications. They can, of course, show the greatest reduction in evaporation on working tanks. The Wiggins Breather Roof, a companion type, is particularly designed for standing storage. We have interesting literature on both these types. Ask for it.

A: *Inefficient seal. The shoes were held away from tank an extra ⅞ in.—losing effect of tall slot. No secondary seal.*

B: *Inefficient seal. The shoes were held away an extra ¼ in. It is seen that some effect of the tall slot was restored. No secondary seal.*

C: *The Wiggins seal with its present efficiency. With secondary seal.*

Send for this new book on Wiggins Floating Roofs.

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FLOATING *for working storage*

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BREATHER *for standing storage*

O&GJ 5-10 Gray

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THERE is an "OILWELL" Production Hoist for every need—for use with reduction gears or by drive from electric motor, gas or gasoline engine, or steam engine.

They are made in single brake and double brake types, and with friction clutch or jaw clutch, as illustrated.

Detailed information will be cheerfully furnished at any of our 100 Branches.

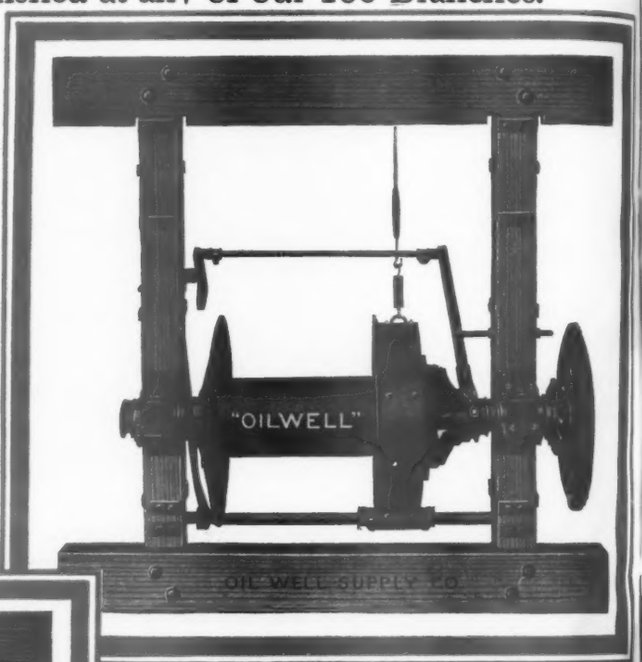
The "OILWELL" Production Hoists illustrated on this page are single brake with friction clutch, and the drum operates on Timken Tapered Roller Bearings. The hoist shown below has the shaft extended for bull wheel drive.

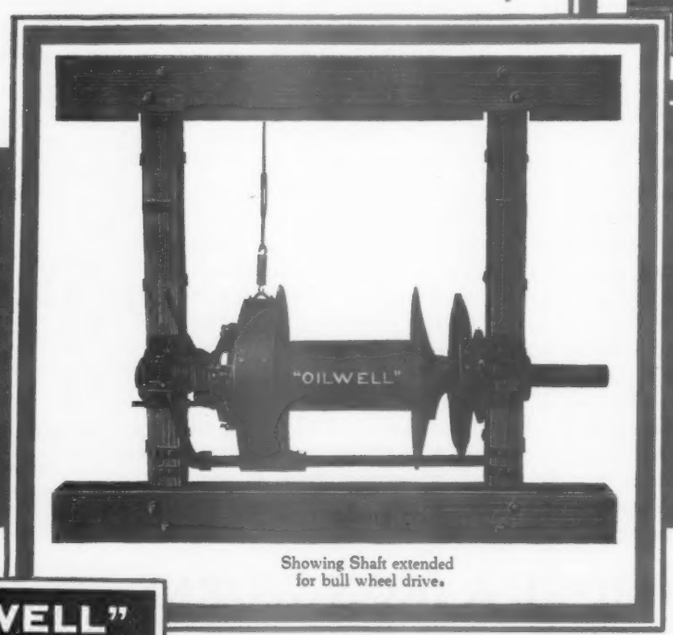
The spooling capacity of either hoist is 7500 feet of 5/8-inch, 5000 of 3/4-inch, 3500 feet of 7/8-inch or 3000 feet of 1-inch wire line.

Brake bands are 8-inches wide with a total braking surface of 625 square inches.

The shaft is 5 inches in diameter.

The weight of either hoist is 5200 lbs.





Showing Shaft extended for bull wheel drive.

... WITH FRICTION CLUTCH

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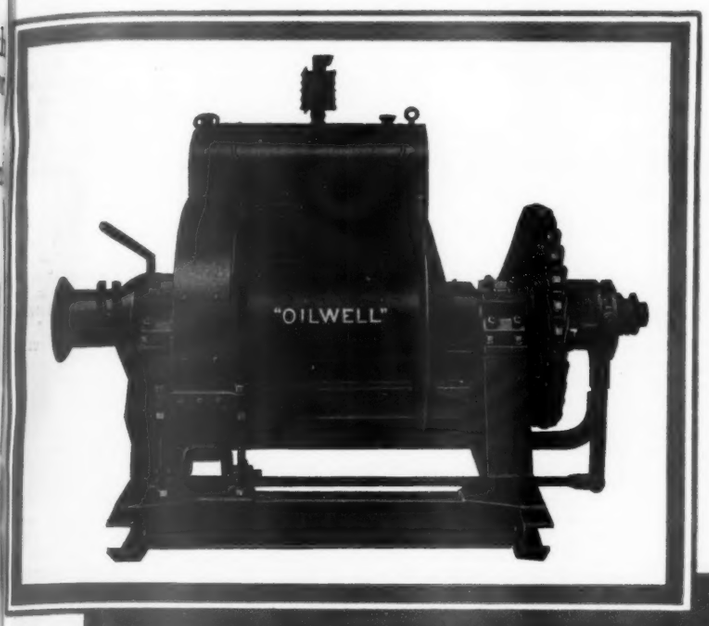


WITH JAW CLUTCH

The "OILWELL" Production Hoists illustrated on this page are equipped with a jaw clutch and the drum is keyed to the shaft.

On either hoist the clutch can be furnished foot operated or hand operated.

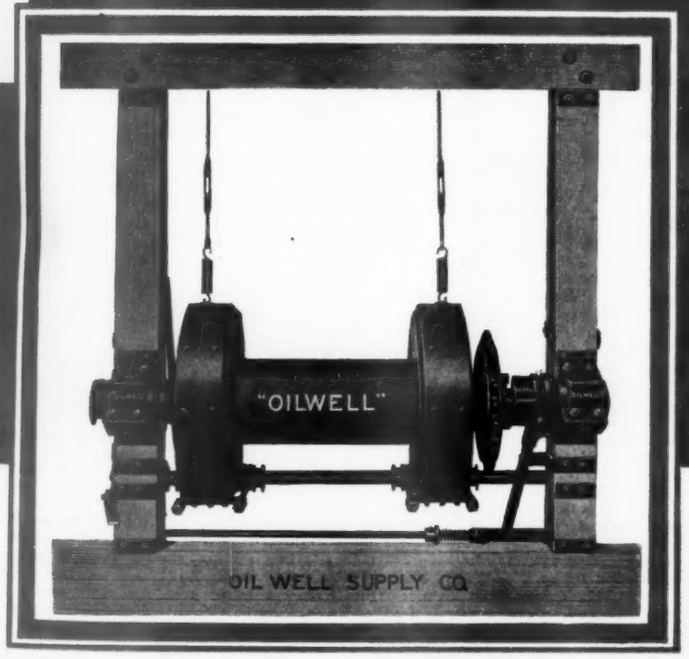
The Portable Outfit, illustrated opposite, is equipped with a cathead, and can be furnished in either single or double brake type.

The spooling capacity is 5500 feet of ½-inch, 3500 feet of ⅝-inch, 2400 feet of ¾-inch, 1800 feet of ⅞-inch or 1300 feet of 1-inch wire line.

Brake bands are 7-inches wide with a total braking surface of 550 square inches for the single brake type and 1100 square inches for the double brake type.

The shaft is 3 7/16-inches in diameter.

The weight is 4800 pounds.



This hoist can be furnished in single or double brake type.

The spooling capacity is 4300 feet of ⅝-inch, 2900 feet of ¾-inch, 2200 feet of ⅞-inch or 1700 feet of 1-inch wire line.

Brake bands are 8-inches wide with a total braking surface of 600 square inches for the single brake type and 1200 square inches for the double brake type.

The shaft is 4 15/16-inches in diameter.

The weight is 4600 lbs.

SUPPLY CO.

BURGH, U.S.A.

BRANCH STORES IN ALL OIL FIELDS

Wetzel County Has 150 Barrel Well

West Virginia Completion Best in Eastern Fields Outside of Perry County, Southeast Ohio

By D. S. Wakenight
Staff Correspondent, Eastern Fields

PITTSBURGH, Pa., May 7.—In the way of new production the month just closed was the best in many months. This was due almost entirely to the wells completed with a large initial production in Perry County, Ohio. The wells completed in this county had a higher initial production than any one district in a number of years. Seventeen wells in this county gave new production in excess of 3,000 bbls. at the time of completion. In new work under way and starting, it is still the most active in the eastern fields. At the close of the month there were seven rigs up and 18 wells drilling. In the list of completions there were but three dry holes. This may be considered a very good record.

In the rather small list of completions outside of southeast Ohio, West Virginia had the only innovation, having drilled in the best producer those fields have furnished in a long time. Gassers have been of more frequent occurrence in that State than oil producers. A greater number of districts in West Virginia reported nothing doing than for several years.

Best Producers for the Week

Very few good producers were completed during the week. The best are located in the deep sand territory in southeast Ohio. In Section 16, Jackson Township, Guernsey County, the Preston Oil Co. got a 50-bbl. producer at a second test on the R. E. Dennis farm. In the NE of Section 20, Harrison Township, Perry County, H. O. Burkhardt and others completed in the Clinton sand a test on the Jennie Nelson lot. It flowed 85 bbls. the first 24 hours after shot in the Clinton sand.

In the SW of Section 24, Washington Township, Hocking County, the Gordon Oil Co. completed and shot in the Clinton sand No. 5 on the James Brimner farm. It produced 56 bbls. the first 24 hours and is located 800 feet southwest of No. 4 on the same farm.

In Section 1, Perry Township, Licking County, Kunsle & Co. completed in the Clinton sand a test on the Joseph Chaney farm. It is a gasser good for 1,000,000 feet and spraying about 7 bbls. of oil a day. In the NE of Section 29, Salisbury Township, Meigs County, the Cabin Oil Co.'s test on the Esther Reuter farm is a gasser good for 500,000 feet and showing a little oil.

In Marion Township, Morgan County, Burns & Co. have completed a test on the Joseph Mosier farm. It is a light gasser in the stray sand below the Berea grit. The location is 2 miles west of Chesterhill.

Athens County

At Berene, Section 12, Rome Township, Athens County, the First National Bank of Marietta has a light pumper in the first Cow Run sand at No. 18 on the A. C. Finsterwald farm. One-half mile west of Amesville, Section 3, Ames Township, Charles Fox and others have a gasser in the stray sand at a test on the N. F. Dean farm. One-half mile north of Amesville, Section 3, same township, H. O. Bode has a light gasser at a test on the O. D. Jones farm.

Located in the southwest quarter of Section 35, Rush Creek Township, Fairfield County, Frank C. Linton and others have completed in the Clinton sand a test on the Edson B. McCullough farm. It is a 10-bbl. pumper. In Falls Gore Township, Hocking County, the Griffin Producing Co. completed in the same formation No. 6 on the Dora Thomas farm. It is a light gasser and has filled up 500 feet with fluid. It will probably be good for 5 bbls. a day.

Perry County

In the NW of Section 20, Harrison Township, Perry County, the Ohio Fuel Supply Co.'s test on the B. F. Brown farm is a gasser good for 1,250,000 feet.

S. B. Boyce & Co. have a 5-bbl. pumper in the Berea grit at No. 16 on the W. L. Groves & Co.'s farm, in the SE of Section 21, Knox Township, Jefferson County. In Salisbury Township, Meigs County, the Cabin Oil Co. has started to drill a test on the E. R. Reuter farm.

The shallow sand districts are completing very light pumpers. In Section 114, Salem Township, Washington County, Weir & Schramm have completed in the Mitchell sand a test on the C. A. Palmer farm. It will not be good for more than a fraction of a barrel. In Independence Township, Lydia Schneider and others have completed a test on the Mary Hood farm. It is a light gasser and shows a little oil.

Best Shallow Well Completed

The best shallow sand well completed in many months is H. A. Sutton & Co.'s No. 5 on the Charles Williams farm, in Section 5, Cross Creek Township, Jefferson County. It is good for 25 bbls. a day in the Berea grit. In Section 16, Knox Township, S. H. Boyce and others have completed a test on the W. L. Groves & Co.'s farm, good for 4 bbls. a day, in the same formation. In the same township, Cable Brothers are drilling a test on the B. W. Cooper farm. In Springfield Township, Brown, Vorhees & Co. are drilling a test on the Dorrence heirs' farm.

In Section 13, Killbuck Township, Holmes County, the Kemrow Co.'s second test on the Charles Shuy farm is a gasser in the Clinton sand. In Section 10, Monroe Township, the Empire Gas & Fuel Co.'s No. 2, on the M. G. Bird farm is dry in all sands. In Salt Creek Township, the same company is drilling a test on the John S. Miller farm.

Licking County

In Perry Township, Licking County, Farmer & Rugg's second test on the Edward Wright farm is an 8-bbl. pumper. In Hanover Township, Farmer and others have a 4-bbl. pumper on the C. M. Hillery farm. In Fallsbury Township, W. L. Brown & Co. have a 4-bbl. pumper in the Berea grit at No. 4 on the G. W. Chapin farm. In Licking Township, Muskingum County, the Hope Refining & Construction Co. is drilling on the A. Butler farm.

In Section 1, Elk district, Noble County, Homer Newhart & Co. are drilling a test on the Everett Hanschumaker farm. In Lodi Township, Athens County, Cook & Co. are drilling a test on the Hugh Milligan farm. In Lee Township, the Logan Gas Co. is drilling a test on the L. E. Searls farm. In Section 20, Grandview Township, Washington County, the Yellowhouse Oil & Gas Co. has a very light pumper in the Big Injun sand at a test on the James Davis farm.

In Section 21, Harrison Township, Perry County, William Cline and others are drilling two tests on the Burley-Winter lot. In the same section, the Wehrle company is drilling three wells on the Claude A. Pletcher farm. The same company is drilling a test on the Douglas Luster farm, and has a rig completed on the John Ferguson farm. H. T. Burley & Co. are drilling on the J. E. McClure farm, and the Northern Petroleum Co. is drilling a test on the Mary Nelson farm. Scott Howell and others have a rig up for their second test on the Burley-Winter farm.

In Section 24, Coal Township, Perry County, deep territory, the Hope Construction & Refining Co. is due in the Clinton sand at a second test on the Edward L. McClure farm. In Section 21, Harrison Township, William Cline and others have rigs up on the W. J. Forquer, F. W. Griswold, and the A. E. Hull Pottery Co. farms. H. C. Burkhardt & Co. are due in the Clinton sand at a test on the Jennie Nelson farm. The same company has a rig up on the Zanesville Coal Co.'s property.

In the southwest quarter of Section 8, Harrison Township, Perry County, J. W. Leonard has completed No. 4 on the David Allen farm. It is good for 10 bbls. a day in the Clinton sand. In the southwest quarter of Section 4, Fairfield Township, the Wiser Oil Co. has completed a test on the Laura B. Clark farm. It is a gasser in the Clinton sand good for 1,500,000 feet and showing a little oil. In the southwest quarter of Section 21, Harrison Township, William Cline and others have drilled a test on the Hull Pottery Co.'s property into the Berea grit. It is a fair gasser and later will be drilled to the Clinton sand. For the present it will be used as a gasser.

Hocking County

In the southwest quarter of Section 30, Ward Township, A. H. Squires & Co. have completed in the Clinton sand No. 17 on the Cobb-Bradley farm. It is good for not more than 6 bbls. a day. In the southwest quarter of Section 23, same township, the Kachelmacher estate has completed No. 20 on the James J. Tracy estate. It is good for 17 bbls. a day in the Clinton sand.

Noble County

In Section 33, Enoch Township, Noble County, W. Hesson and others have completed in the Buell Run sand a second test on the John Bryan farm. It is a very light pumper, good for less than 1 bbl. a day. In the southeast quarter of Section 11, Jackson Township, Way Wickens and others have completed a test on the Way Wickens farm. They found only a little gas in the 800-foot sand and a show of oil in the 500-foot sand. No. 2, on the same farm, is a light pumper in the Buell Run sand.

Good Producer in West Virginia

After a long run of light pumpers, dry holes and gas wells, the West Virginia fields sprang a surprise by presenting a good producer in old territory. It is R. F. Worden & Co.'s test on the C. T. Midcap farm, in Green Township, Wetzel County. The first 15 hours after drilled into the Big Injun sand it produced 150 bbls. It was then shut in and when opened again produced 85 bbls. the ensuing four hours. There is room for more locations in the vicinity and if the well holds up there will be no time lost in starting new work.

On Leatherwood Run, Big Sandy district, Kanawha County, the United Carbon Co. has completed No. 19 on the Osborne farm. It is a gasser good for 3,000,000 feet in the Weir sand. The location is 2,200 feet southeast of No. 18 on the same farm. On Poca River, Kanawha district, the Chartiers Oil Co. completed a test on the J. F. Haynes farm. It is a gasser in the Big Lime formation good for 4,000,000 feet.

Lewis County

In Hackers Creek district, Lewis County, the Carnegie Natural Gas Co. has completed in the Benson sand at a total depth of 4,160 feet a test on the W. H. Cartright farm. It is a light gasser. In the same district, the same company has completed in the same formation a test on the Isaac Hineman farm. It is a duster.

The Stanley Run Gas Co.'s test on the W. S. Propet farm is a light gasser in the Benson sand at a total depth of 4,290 feet. The Standard Gas Co. has completed a second test on the Clarksburg Mortgage & Land Co.'s property and is a gasser in the Maxon sand good for 1,000,000 feet.

In Sherman district, Calhoun County, the Hope Natural Gas Co. has drilled a test on the Annie Boyles farm into the Big Injun sand and showing some oil and gas. In Geary district, Roane County, the United Fuel Gas Co.'s test on the J. O. Dickinson farm is a gasser in the same formation. In Sherman district, F. F. McIntosh & Co. have a gasser on the M. J. Bowers farm. In Reedy district, the Heck Oil Co.'s No. 12 on the J. W. Conley farm has been shot with 20 quarts and is good for 10 bbls. a day in the Berea grit.

Marion County

In Paw Paw district, Marion County, the Hope Natural Gas Co.'s test on the F. Lawson farm, drilled deeper, is a gasser in the Fifth sand. The Hope Natural Gas Co.'s test on the Mellville D. Lang farm, in Simpson district, Harrison County, is a gasser in the Fifth sand. In Hackers Creek district, Lewis County, the Standard Gas Co.'s second test on the E. B. Jackson farm is a gasser in the Maxon sand.

At the mouth of Buffington Creek, Spencer district, Roane County, McIntosh, Hardman & Grimm have completed in the Big Injun sand a test on the M. J. Bower farm. It is a light gasser.

In Jefferson district, Pleasants County, Dinsmoor & Co. have completed No. 4 on the Ogden-Ross farm. It is a duster in the Berea grit. In Grant district, same county, E. C. Hartman has completed No. 7 on the Hammett heirs' farm. It will be good for 5 bbls. a day in the Big Injun sand.

On Dry Ridge, Grant district, Ritchie County, the Astron Oil Co. has completed in the Big Injun sand No. 10 on the Herman Stursburg Realty Co.'s property and not better than a 2-bbl. pumper.

On the waters of Sycamore Creek, Sheran district, Calhoun County, located 1,400 feet west of the Sycamore Fuel Co.'s test on the L. J. Morris farm, the Hope Natural Gas Co. has completed a test on the Anna Boyles farm. It produced 15 bbls. after shot in the Big Injun sand. This was the only completion reported from the West Virginia fields.

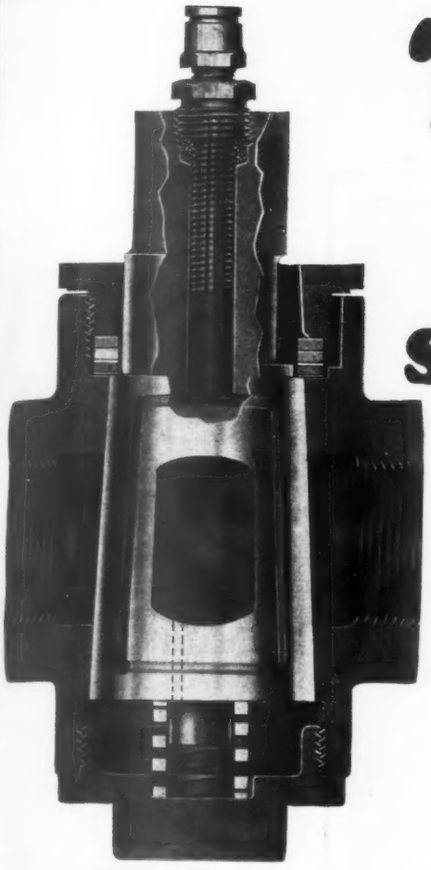
In Lee district, Calhoun County, Everett Starche & Co. have started to drill a test on the Adam Kerby farm. In Sheridan district, the Neely Oil & Gas Co. is rigging up on the L. C. and A. L. Beall farm. In Union district, Tyler County, the Little Flower Oil Co. is drilling on the Anderson farm. In Geary district, Roane County, the United Fuel Gas Co. has made a location on the W. T. Graham farm.

Drilling Deep Test

In Hackers Creek district, Lewis County, the Anglin Oil & Gas Co. is drilling at 4,100 feet on the E. M. Fleming farm. In Mannington district, Marion County, the Carnegie Natural Gas Co. is down 3,171 feet on the Ambrose Harhurst farm and shut down for orders. In Genville district, Gilmer County, the Sears Oil & Gas Co. is due in the Big Injun sand on the A. C. Campbell farm.

On McFarlan Creek, Murphy district, Ritchie County, the Cunningham Oil Co. has the rig completed for a test on the Lamp heirs' farm. In Lincoln district, Marion County, the Mack Bell Oil & Gas Co. has started to drill on the John F. Pitzer farm. In Fairmont district, the Owens Bottle & Machine Co. has started to drill on the Scott Arnet farm. In New Milton district, Doddridge County, W. Claude Maxwell is drilling a test on the Seventh Day Baptist Church lot.

(Continued on Page 171)



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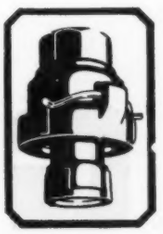

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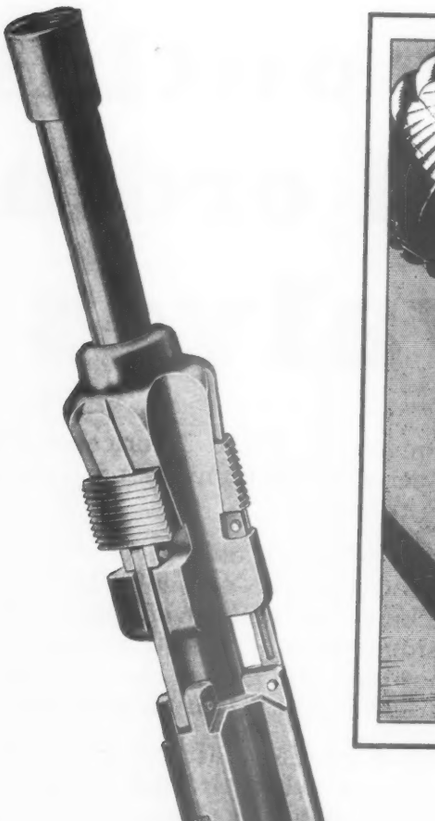

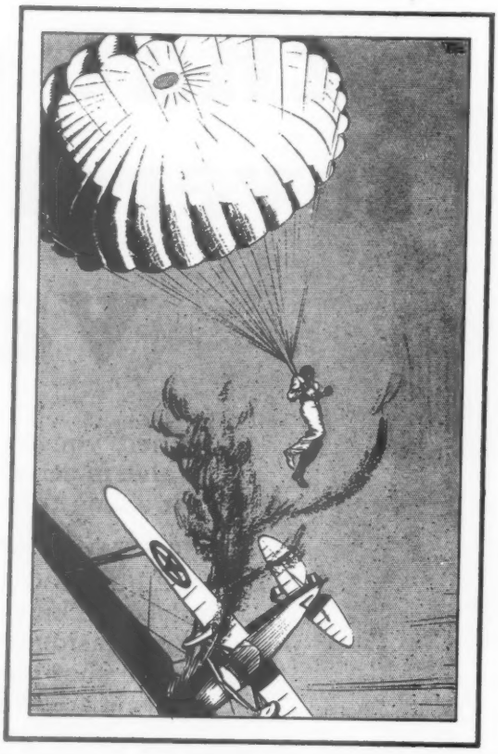

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Field Problems and Their Solution

EDITED BY THOMAS F. SMILEY

In order that men connected with the drilling, producing and transporting branches of the petroleum industry may procure quickly a solution of many problems confronting them from time to time in their work, The Oil and Gas Journal has arranged with leading engineers and other recognized authorities to answer questions submitted by readers of this publication pertaining to the work of drilling and producing crude oil and transporting this product.

Everyone is invited to submit questions freely. These questions will be submitted to proper authorities by Mr. Smiley, who edits the page, and answers, based on the best available information, will be published. Each question should give as much detail as possible, especially where it relates to matters where depths of sands, types of sands and operations on adjoining properties would have a bearing on the problem involved. The source of all questions will be considered as confidential and only initials will be published in connection with the question.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or practices which are improvements.

In case an immediate answer is important, one will be given by mail if the writer requests it.

CAN'T PULL THE TUBING

We have a gas well approximately 760 feet deep. The casing runs to about 736 feet and we have a string of tubing set on a packer in the bottom of this casing. The well makes no water, but there is oil seeping in from (we believe) the sand, and on account of its low gravity it will not blow out when the well is opened. It has practically killed the flow of gas from this particular well.

We had decided to pull the tubing to clean out and rerun with working barrel and a string of rods to pump when we found that the well was not properly protected after being tubed, and it looks as if there is dirt, rocks and other foreign substances thrown in between the tubing and casing so that it will be impossible to pull the tubing. We are wondering if a bleeder would help us out, as it seems the only thing left for us to do (unless we move a machine in over the hole) would be to run a string of 1-inch or three-quarter-inch pipe as a bleeder, but we are afraid that even this may not work, as the oil is only about 16 gravity and the rock pressure on the well is now only about 25 pounds.

The well originally came in at about 15,000,000 feet with 290 pounds rock pressure. It produced for several years through the casing, and after the well had gone practically dead it was cleaned out and it came back with about 2,000,000 feet open flow at 100 pounds rock pressure. We then ran tubing in on a packer, as mentioned above, with the idea that the tubing would permit the gas to carry any oil it made with it. But this has not proved the case, which we believe, as stated, to be on account of the extremely low gravity of the oil. Will appreciate any suggestion or advice in this matter.—L. M.

Some gasoline run into the well might help to reduce the viscosity of the oil sufficiently to blow it out of a 1-inch siphon line. You say you have a shut-in pressure of 25 pounds. This is equivalent to a head or submergence of approximately 60 feet. A one-sixteenth-inch hole placed about 10 feet above the cage, which is placed 5 feet off bottom, and another hole at 350 feet from bottom will probably be sufficient to remove the oil provided it is not too viscous to flow through the 1-inch line. However, it may be necessary to place two jet holes at the lower jet-hole level. You could use the gas line running from the well into the main gathering line to introduce high pressure gas in order to start the bleeder or siphon operating. Care must be taken when introducing the high pressure gas not to attempt to force too large a volume of gas into the tubing because there is danger of forcing the debris which is present in the well back into the sand and thus effectually seal off the sand.

Another possible remedy would be to place a light shot in the bottom of the well. This could be run in through the tubing. Possibly 3 quarts and not more than 5 quarts should be used. Good results have been obtained in your part of the country by using light shots to increase the gas production.

These suggestions are merely alternatives in event that you do not or cannot pull the tubing. Pulling the tubing would very likely be a more positive method for obtaining best results.

FORMULA FOR PIPE CAPACITY

Is there any rule for finding out the amount of fluid standing in a hole when you have the size of the pipe and the height of the fluid? This would be a big convenience a good many times. For instance, I had 700 feet of oil standing in the 8¼-inch. Isn't there some fairly easy way of figuring how many barrels that was?—T. R. E.

A formula that probably will serve your purpose is this: The number of barrels of oil that 1,000 feet of a given size of pipe will hold is approximately the same as the number of inches in the square of the inside diameter of that pipe. The square of the inside diameter of your 8¼-inch pipe (8¼ by 8¼) is approximately 68 inches. Then, according to the formula, 68 bbls. is the capacity of 1,000 feet of this pipe. You had 700 feet of oil. As 700 is seven-tenths of 1,000 you know that seven-tenths of 68 is the number of barrels in the 700 feet. This you find to be approximately 47 bbls. While this is about 3 per cent greater than the actual capacity, it provides a method of obtaining a reasonably close field estimate. By writing to the United States Bureau of Mines you can get a set of tables giving accurate casing capacities.

LOOP MAY SOLVE DIFFICULTY

I am flowing a number of wells on one of our leases and am using a common header. One of the wells needs more gas than the rest and in order to put the required amount down the well the gas must be pumped to a higher pressure than is necessary for the other wells. Is there any way in which I may be able to overcome this difficulty?—A. E. H.

You could overcome the difficulty by laying a larger gas line from the header to the well requiring a larger volume of gas However, as the gas requirements will decrease as the oil production declines, it would be more economical to lay a loop; that is, sufficient line from the well and towards the header to accommodate the additional volume of gas required. Then as production declines to the point where the original gas line will handle the required gas volume, the loop may be removed.

ACCURACY OF GAS-RESERVE ESTIMATES

Can the gas reserves in a structure be computed with any degree of accuracy, or is it after all more or less guesswork? Judging from the difference in opinion as to the best way to determine a gas reserve it would seem that a reasonably accurate method has not been devised. I have seen estimates made on the same field differ as much as 500 per cent. Also why is it that two engineers using the same method and data on the same reserve will arrive at different results? I have attempted to make estimates based on the known methods, such as the saturation method and rock-pressure decline method, and apparently my estimates do not take some factor into account because they are always high. Knowing this, I often make deductions after I have calculated the reserves. A little information on this subject might be helpful not only to myself but to others who are called upon occasionally to estimate gas reserves.—D. D. M.

Irrespective of the method used, in estimating reserves, there are certain reasons why estimates made by competent engineers on the same reserves will differ. No standard base is used or has been adopted for use in calculating reserves. For example 14.4, 14 7 or 15 pounds may have been used as the atmospheric pressure, also a 4-ounce, 6-ounce or 2-pound or some other base may have been used. Again one engineer will take into account all gas blown to the atmosphere or used as fuel whereas another will be interested only in the gas which will be marketed, assuming that he is working for a gas company and is studying the advisability of his company laying pipe line or installing compressors for boosting the gas. Thus when estimates made on the same reserve do not coincide it is well to note whether they were made on the same basis.

For purposes of comparison some standard base should be adopted, regardless of locality or pressure at which the gas is purchased or sold. Also estimates should take into account the total gas taken from a structure, regardless of whether it was piped from the field, used under boilers or blown to the air The total volume may then be segregated under several subdivisions such as gas used for field fuel, gas wasted in blowing wells, and gas marketed. The reason for this is that gas now being blown to the air may be made available for market by adopting some other method for determining well capacities, also the gas used for boiler fuel in the field is a variable and after drilling is over with, may be used for other purposes. A continual reminder of the amount of gas being wasted eventually results in steps being taken to conserve the gas as much as possible, especially when a shortage of gas occurs.

The reason for standardizing the methods used in estimating gas reserves cannot be emphasized too much. Witness the various rate cases concerning gas reserves. In these, a company engineer is at a disadvantage. From the very fact that he is working for the success of his company, it is only natural and right that he should be primarily interested in the quantity of gas that will be available for marketing. Usually the gas company has no control over the general field practices which may or may not be wasteful of gas, yet no mention may be made of gas actually wasted or used for fuel.

Considerable discussion has taken place from time to time as to the relative merits of the different methods for estimating gas reserves. Irrespective of method, the general tendency is to arrive at reserves in excess of the volume that will be eventually recovered and the reasons for this are in part due to the general acceptance of Boyle's law as applied to estimating reserves.

Very few gas fields are entirely free from water and as the gas pressure in the sand declines, the effect of the hydraulic head of the edgewater becomes increasingly important. Boyle's law assumes a constant volume reservoir, whereas the encroachment of the water results in a constantly decreasing reservoir. Also, owing to the compressibility of the gas, estimates based on the first 5 per cent of the gas withdrawn would be higher than later estimates would indicate. As the pressure in the reservoir becomes lower the compressibility factor or deviation from Boyle's law becomes less and for that reason estimates based on the rock-pressure decline-volume method over a greater drop in rock pressure—for example to one-half the initial pressure—will result in a more accurate estimate of the recoverable gas. The compressibility factor can be taken into account at any period and corrections made.

The saturation method has its drawbacks, the chief ones being difficulty in arriving at an average porosity and sand thickness, also lateral extent of the reservoir.

However, by exercising good judgment and allowing for these variables, estimates can be made with a reasonable degree of accuracy If estimates come within 10 per cent of being right—and they do that a surprising number of times when the corrections noted here are made—it would seem that they are of great value.

PUBLICATIONS ON REPRESSURING

Will you kindly advise me where I may secure a treatise on gas repressuring?—C. K. A.

An excellent work on repressuring with gas is the United States Bureau of Mines bulletin No. 148, by J. O. Lewis, "Methods for Increasing the Recovery From Oil Sands." Another article which may be helpful is in the Natural Gas number of The Oil and Gas Journal, published June 16, 1927. "Gas for Repressuring Old Fields." You may obtain the Lewis bulletin by application to the Superintendent of Documents, Government Printing Office, Washington, D. C.

CEMENT IN SALT WATER

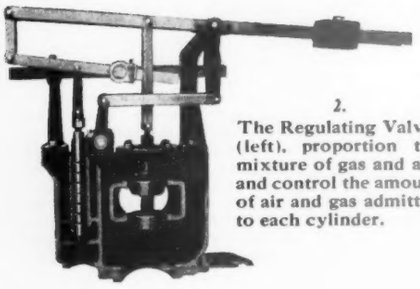
Is it necessary to use only fresh water in mixing cement for shutting off water in oil or gas wells? Will the cement set when there is salt water in the well?—N. P. S.

Tests have demonstrated that cement will set in salt water and that water shutoffs may be obtained. Engineers have performed tests in which comparisons were made between cements set in fresh water, in salt water and in oil. While the comparative tests conducted by the different men did not exactly check each other, the general conclusions were the same. These conclusions were that cement will set in oil field water although it requires a longer time to set in salt water than in fresh water or in oil.

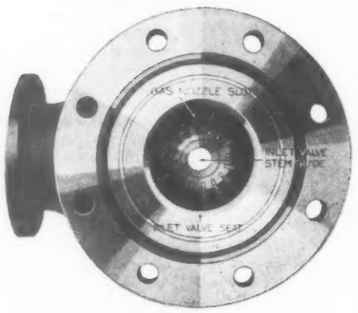
One engineer suggests that it is advisable to mix the cement with the well water obtained from the well in which the cement is to set. He also suggests that 1½ pounds of calcium chloride should be mixed with each sack of cement. This is in excess of the amount customarily used to hasten the setting of the cement.

PICTURES of the TRANSIT GAS ENGINE

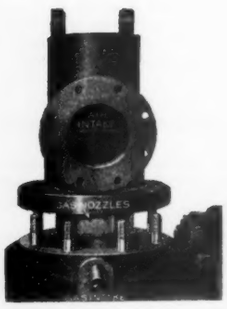
1.
Mr. S. B. Daugherty (left), the designer, is well known to many natural gas men as a designer and technical gas man.



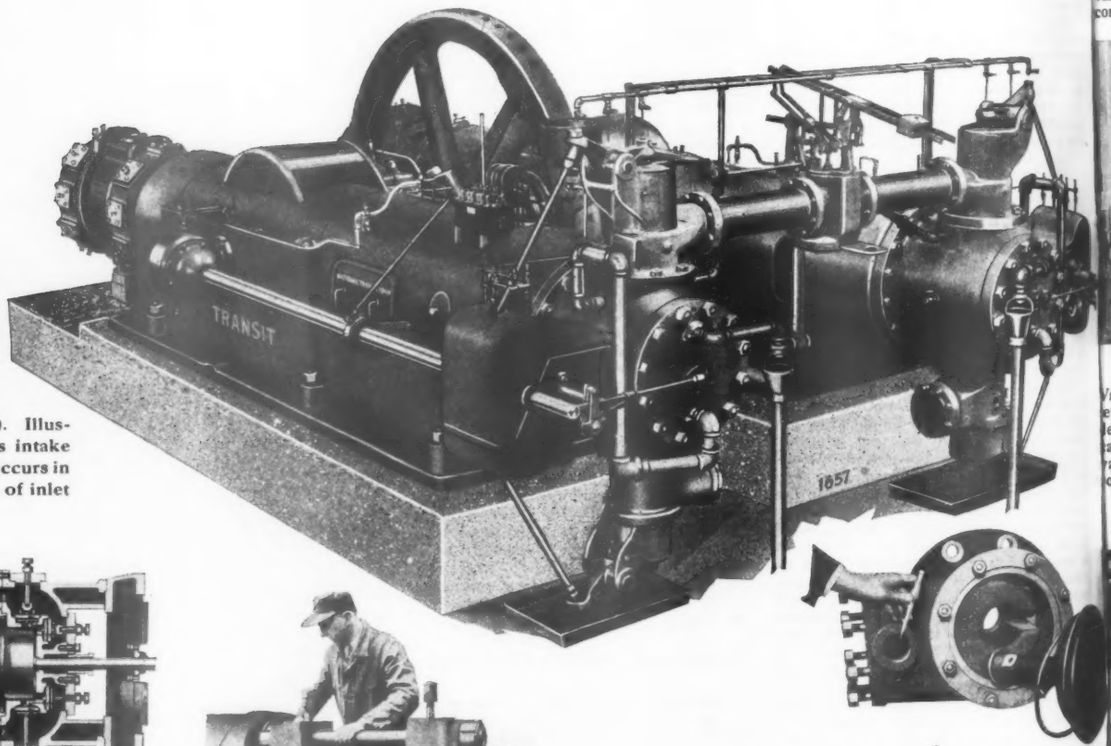
2.
The Regulating Valves (left), proportion the mixture of gas and air, and control the amount of air and gas admitted to each cylinder.

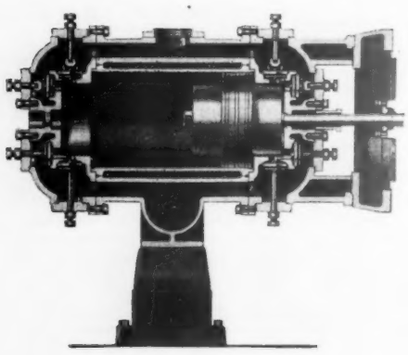


3.
Inlet Valve, gas nozzle arrangement (left). The vacuum produced on the intake stroke draws in the air over and around the gas nozzles projecting into the air stream, and the correct amount of gas as metered by the regulating valve, is drawn into the air stream through the long narrow slots of the gas nozzles in the form of thin ribbons of gas.



4.
Inlet Valve Casing, (above). Illustrating air intake and gas intake into inlet valve. Mixture occurs in inlet valve, just 1¼" ahead of inlet valve seat.





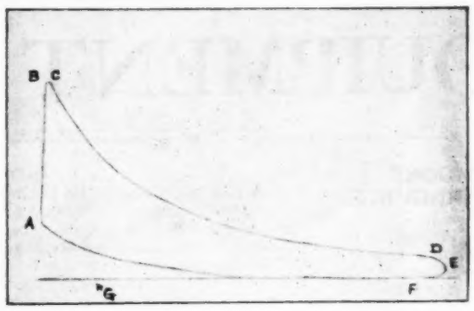
5.
Compressor Cylinder (above). Removable liners, valves in the heads, and stepped pistons permit diameter of liners and pistons to be changed with a minimum of trouble and expense. A very wide range of interchangeability is secured.

6.
A Tie Bolt (above), is provided through each frame at each main bearing. The weakening effect of the gap in the frame for the main bearing is entirely eliminated by this tie bolt.

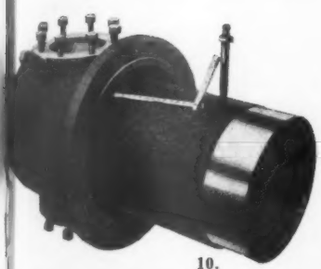
7.
Exhaust Valve Casing, Upper Part (above). Note entrance of cooling water at pencil point, removable flanged sleeve with rubber gaskets, and slot for elimination of air pocket.

NATIONAL
New York
Pittsburgh
Philadelphia
Cleveland
Pump and Oil

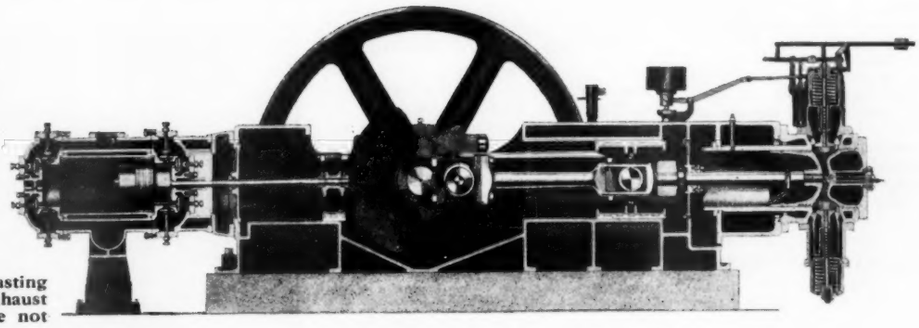
SHOW NEW 17x24" COMPRESSOR



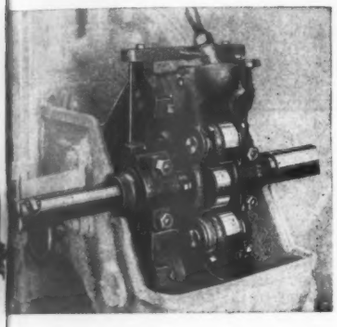
16.
Unretouched Indicater Diagram, [above], from left-hand cylinder of this engine. Diagram shows a nearly perfect mixture.



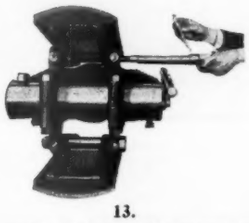
10.
Each power cylinder, (above,) is a separate casting with its inlet valve on the upper side and the exhaust valve on the lower side. Bolting strains are not communicated to the cylinder bore.



15.
Longitudinal Section. TRANSIT Model 26 Gas Engine Compressor, (above).



11.
Valve Mechanism, cover removed (above). Cam, cam levers and rollers are completely enclosed in a box with detachable cover, bolted to the outside of each cylinder casting. A single cam actuates the intake valve, exhaust valve and air starting valve. Broad faced cam and cam rollers insure long, accurate life to these important parts.

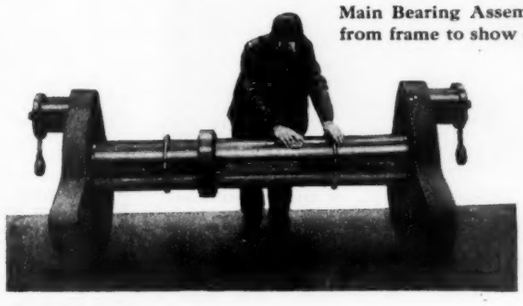


13.
Eccentric Bolt for adjusting crosshead shoes, (above). Crosshead shoes are of the hinged type, adjustable for wear by means of eccentric bolts passing through lugs on the crosshead.

14.
Air Starting and Check Valve Assembly(above) The same cam that operates the inlet and exhaust valves is also used to operate the air starting valve. No chatter.

8.
Main Bearing Assembly (above), removed from frame to show construction.

12.
Connecting Rod, (above), is an open hearth steel forging with a solid end for the wrist pin and a marine type box for the crank end. The wrist pin boxes are steel castings, babbitt lined and wedge adjusted. The crank pin boxes are of steel, lined with the highest grade of babbitt.



9.
The short stubby crankshaft, (above), is 11½" in diameter. Distance between center of main bearing to center of crank pin is very short.

TRANSIT Machine Co.
City, Pa.

Los Angeles
Houston
Tulsa

All above illustrations were reduced from the originals in our new catalogue on this engine. A copy will be sent gladly to any natural gas man.

EQUIPMENT AND SUPPLIES

NEW DERRICK, MOORE CHAMPION, ANNOUNCED

Lee C. Moore & Co. of Pittsburgh, Pa., and Tulsa have announced a new derrick named the Moore Champion. Its outstanding features are leg sections of galvanized 40-50 carbon A.P.I. seamless steel pipe; a new rolled-steel plate clamp; through bolts in leg sections and clamps; interchangeable fronts; reinforced steel base-plates; structural bracing, either aluminum-painted or galvanized; and wing bracing in bottom panels. The Moore Champion derrick conforms to A.P.I. specifications throughout.

Lee C. Moore & Co. organized in 1907 and pioneers in steel-derrick manufacture, state that more than six years has been spent by their engineers in experimental work and special study, preparatory to the design of this new derrick. In addition to strength and rigidity, especial attention has been devoted to ease of erection, and of dismantling.

Steel bull-wheels, band-wheels, calf-wheels, pitmans, walking-beams and all-steel drilling rigs are other equipment manufactured by Lee C. Moore & Co.

TRADE LITERATURE RECEIVED

A folder issued by Gramm Motors, Inc., Delphos, Ohio, recounts the good qualities of Gramm trucks and coaches and gives a brief sketch of the president and treasurer of the company, B. A. Gramm.

The development and service of Armco ingot iron are told in a 48-page booklet published by the American Rolling Mill Co., Middletown, Ohio. Twenty-six pages are devoted to illustrations of the company's plants and to various steps in the manufacture of its products.

The Climax Green Sheet, printed by the Climax Engineering Co., Clinton, Iowa, is a four-page folder devoted to the company's new automatic spark control.

The General Refractories Co., Philadelphia, Pa., is mailing a 22-page booklet describing Grefco, a high-temperature cement, with pictures.

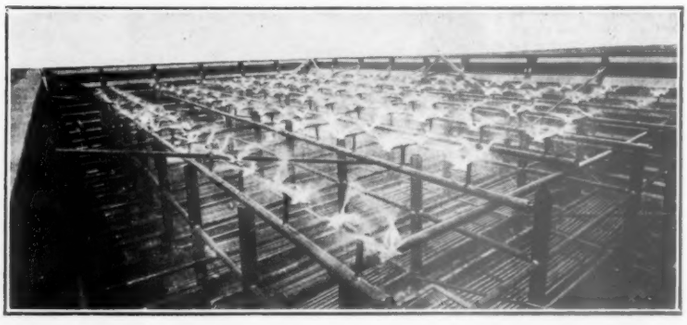
CHECKING SUMMER FATIGUE

Sanitary, properly cooled drinking water, along with good ventilation, is the best weapon for fighting hot-weather fatuge and the lowered efficiency that accompanies it, according to a booklet issued by the Century Brass Works, Inc., Belleville, Ill., entitled "Maintaining Capacity Production in Hot Weather." Among advantages of Century Drink-King Fountains, according to the booklet, are that they prevent spreading of infectious diseases, cut production losses caused by fatigue, save workers' time, are fool-proof, and are made for either ice or electric cooling.

NEW COOLING APPARATUS CRACKS OFF SCALE

The patented G-R Bentube section recently developed by the Griscom-Russell Co., New York, is a cooler and condenser that automatically cracks off scale deposited on the cooling surface by the cooling water.

The apparatus consists of a series of Admiralty metal tubes set with an initial curvature into cast-iron headers at each end. The liquid or gas to be cooled or the vapor to be condensed passes through the tubes, and the cooling effect is obtained either by showering water down over the tubes from distributing spray nozzles or a cooling tower set above them or by submerging the entire unit in a tank of water.



Bentube sections of the Indian Territory Illuminating Oil Co. A typical installation.

As the cooling water is heated or evaporated on contact with the hot tubes, it leaves behind deposits of scale which in other types of coolers would continue to accumulate on the cooling surface and gradually decrease the cooling effect until the scale was broken off by hand or machine.

In the G-R Bentube section, however, hand scaling is unnecessary as the scale-shedding features of these units automatically prevent scale from building up to a thickness that would reduce the effectiveness of the apparatus.

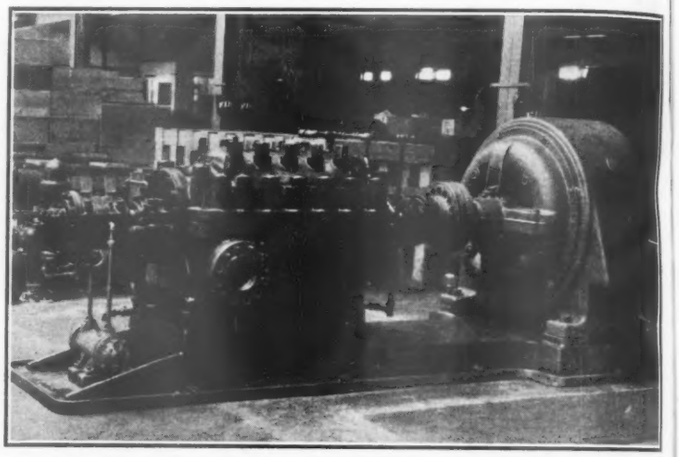
When the hot liquid, gas or vapor passes through the tubes, the resulting expansion greatly accentuates the initial bowing of the tubes. If the flow of the hot fluid is interrupted, the tubes again contract to their initial curvature and this readily controlled change in flexure is made use of to crack off scale accumulations. This principle is also used in the G-R Bentube evaporator for distilling pure boiler feed makeup from hard, dirty or salt-raw water. These evaporators are widely used in central power stations and industrial plants throughout the country.

In service, changes in curvature of the tubes may be accomplished either by stopping the flow of cooling water while the hot fluid continues to pass through the tubes or by stopping the flow of the hot fluid while the cooling effect is continued. In the former case, scale is cracked off by the increased distortion of the tubes caused by the additional heating effect, and in the latter case, scale is cracked off by the contraction of the tubes as they cool.

The G-R Bentube section is regarded as particularly advantageous in applications where the cooling water supply is of poor quality, and may be used for cooling oil, gas, jacket water and industrial liquors or for condensing steam or vapors of various oils and chemicals.

LARGEST CENTRIFUGAL PUMPS FOR OIL-LINE USE INSTALLED

The world's largest two centrifugal pumps designed for oil pipe line service are being installed by the Ingersoll-Rand Co. for the Standard Pipe Line Co. in the latter's main line stations at DeQueen and Mandeville, Ark., the latter a short distance from Texarkana on the Missouri Pacific Railroad. They replace the only remaining steam power units on the line from Oklahoma to Baton Rouge and will be placed in service on or about May 1.



This Cameron centrifugal pump, one of the two largest in the world built for oil line use, will deliver 60,000 bbls. a day at 650 pounds discharge pressure. They are being installed by the Ingersoll-Rand Co. for the Standard Pipe Line Co.

Their installation represents the completion of a program of modernizing pumping station equipment from one end of the line to the other that has been under way for several years. They replace two steam-driven fly-wheel type pumps that have been in service continuously since 1908. All prime movers on the line now are either electrically or Diesel engine driven.

Both of the new pumps, as in the case of equipment at the Fouke and Wilton, Ark., booster stations, will be electrically driven, power being made available by completion last fall of the Southwestern Gas & Electric Co.'s high-tension line from Shreveport to DeQueen, which is interconnected with similar lines from the company's generating stations at Texarkanan, Ark.-Tex., and Marshall, Tex.

The pumps, Cameron No. 6 HMT 6-stage centrifugals, will deliver a maximum of 60,000 bbls. a day at 650 pounds discharge pressure; have a rating of 800 b.h.p. and a pump efficiency of 75 per cent. Each will be direct connected to a 1,000-horsepower, Type KPP, 2,200-volt, 3-phase, 60-cycle motor at 1,750 r.p.m. One of the motors will be General Electric, the other Westinghouse.

The saving effected by the installation will be substantial as active and reserve boilers and accessories, fuel and labor expense, etc., are eliminated and greater efficiency in the pumping units is obtained. The old equipment, now obsolete, had a maximum capacity of 5,000 to 10,000 bbls. less than the new. Previous replacements and additions to equipment in the Mandeville and DeQueen stations have all been powered by Diesel engines, effecting marked economy at the time, but now superseded by an uninterrupted adequate supply of even cheaper power.

BUSINESS NOTES

The Timken Roller Bearing Service & Sales Co. announce the appointment of W. H. Post as manager of the Pittsburgh branch office. Mr. Post has been with the company several years.

The Brown Instrument Co. has obtained larger quarters for its Pacific Coast branch in the Westinghouse Electric Building, 420 South San Pedro Street, Los Angeles, Calif. Stanley F. Godfrey is manager.

The Southwestern Engineering Corp., Los Angeles, Calif., has established an agency in Dallas, Tex., with offices at 1217 Magnolia Building.

D. M. Williamson of the Haywood-Williamson Supply Co.'s agency in Shreveport, La., is the inventor of a new packing for use on oil well pumps on which he has obtained patents.

The Columbus McKinnon Chain Co., Tonawanda, N. Y., has acquired control of the hoist division of the Chisholm-Moore Manufacturing Co., Cleveland, Ohio, in which city the factory and general sales office will remain.

PIERCE-ARROW FLEETS SOLD

Four large fleet sales are reported by the commercial car division of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., reflecting the activity in commercial car sales which the company has experienced since the first of the year. The four fleet orders call for a total of 74 Pierce-Arrow commercial vehicles and total over $350,000 for the chassis alone. The large order came from the Pure Oil Co. for 32 commercial vehicles, including five Fleet-Arrow wagons, Pierce-Arrow's new six-cylinder speed unit.

CASING PROTECTORS IN DEMAND

J. A. Ballagh, secretary-treasurer of the Patterson-Ballagh Corp., manufacturers of Bettis casing protectors, left the Los Angeles factory for a tour through the Mid-Continent and Gulf Coastal fields planning to spend three weeks in that territory arranging for distribution of the company's product. During the last 60 days, according to Mr. Ballagh, more than 14,000 of the protectors have been ordered by various oil companies in California.

Factories and General Offices, Pittsburgh, Pa.

DURING the past two years in which the gas industry has had a normal growth, the Pittsburgh Equitable Meter Company has more than doubled its business. While this is a sign of the increased satisfaction with our product, instead of making us content with our progress, it has made us more anxious to serve the gas industry in every possible way.

We are devoting a large part of our income to scientific research work in our Chemical and Physical Laboratories and in our Engineering Department. We believe we have the best technical equipment for testing and developing better devices for gas measurement and gas pressure regulation.

Our resources are at the disposal of the gas industry. A number of new devices are in the process of perfection which will afford definite illustrations of progress in the branch of industrial science to which this company has devoted its efforts.

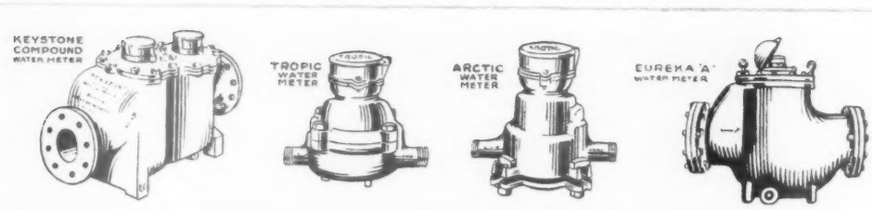
PITTSBURGH EQUITABLE METER COMPANY

MAIN OFFICE AND WORKS
PITTSBURGH, PA.

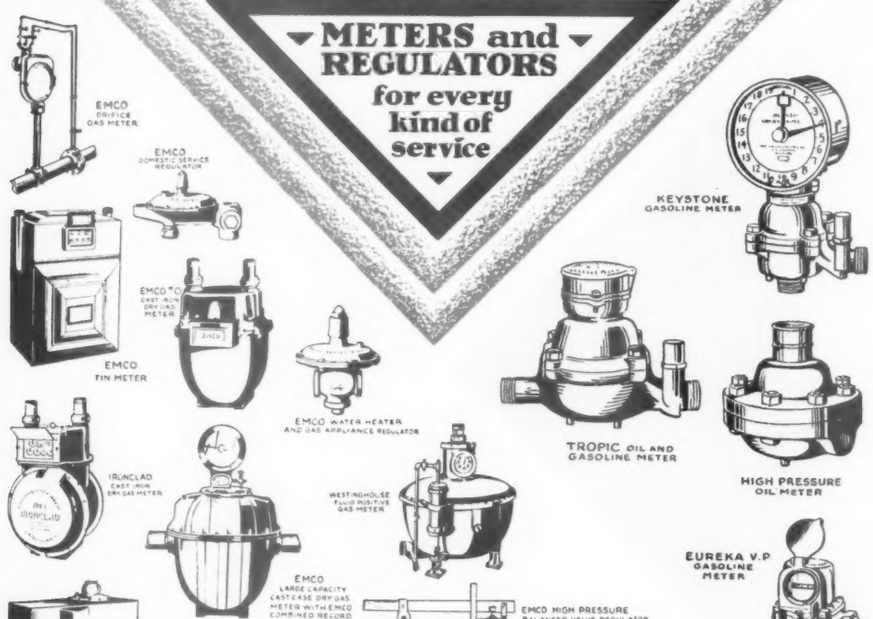
BRANCH OFFICES
NEW YORK CHICAGO COLUMBIA, S.C. LOS ANGELES DALLAS
TULSA SEATTLE KANSAS CITY SALT LAKE CITY

Pittsburgh Equitable Meter Company

Pittsburgh Equitable Meter Company



METERS and REGULATORS for every kind of service


EMCO ORIFICE GAS METER
EMCO DOMESTIC SERVICE REGULATOR
KEYSTONE GASOLINE METER
EMCO "C" CAST IRON DRY GAS METER
EMCO TIN METER
EMCO WATER HEATER AND GAS APPLIANCE REGULATOR
TROPIC OIL AND GASOLINE METER
HIGH PRESSURE OIL METER
IRONCLAD CAST IRON DRY GAS METER
WEST-INGHOUSE FLUID PISTON GAS METER
EUREKA V.P GASOLINE METER
EMCO LARGE CAPACITY CAST CASE DRY GAS METER WITH EMCO COMBINED RECORD GAUGE
EMCO HIGH PRESSURE BALANCED VALVE REGULATOR
EMCO "S" PRESSED STEEL TYPE DRY GAS METER
EMCO "D" CAST IRON CURB BOX METER
EMCO LOW PRESSURE BALANCED VALVE REGULATOR

PITTSBURGH EQUITABLE METER COMPANY

MAIN OFFICE AND WORKS
PITTSBURGH, PA.

BRANCH OFFICES
NEW YORK CHICAGO COLUMBIA, S.C.
LOS ANGELES DALLAS TULSA
SALT LAKE CITY
KANSAS CITY
SEATTLE

ORMISTON-DOYLE COMPANY, PITTSBURGH

Natural Gas Developments

WEST TEXAS BUREAU TO MEET ON MAY 15

WICHITA FALLS, Tex., May 5—W. B. Hamilton, chairman of the Oil and Gas Bureau of the West Texas Chamber of Commerce, has issued a call for a meeting of the bureau to be held in Amarillo Tuesday, May 15. The object will be to render a report of the work accomplished during the last six months and to discuss further plans for carrying out the conservation program adopted by the bureau upon its founding as well as to discuss questions relating to co-operation of the oil men in a way more orderly to develop the fields of Texas.

The detailed program for the meeting will be announced by Mr. Hamilton in the next few days. The members of the bureau are W. B. Hamilton, Wichita Falls, chairman; W. H. Holmes, Amarillo; J. E. Thompson, Breckenridge; Joe Weaver, Eastland; W. M. Massie, Fort Worth; Leon Shield, Coleman; Herbert O'Bannon, San Angelo; W. R. Keeble, Abilene; S. C. Arnett, Lubbock, and Tom Bryant, Cross Plains.

GAS INDUSTRY MEN LECTURE

As a part of the course in Fuel and Gas Engineering at the Massachusetts Institute of Technology, a series of lectures by men who possess special knowledge of important phases of gas manufacture has been given as follows: "Coke-Oven Construction and Operation," by D. W. Wilson, Wilputte Oven Corp.; "Purification of Gas," by F. W. Sperr, Jr., Koppers Co.; "Low-Pressure Distribution," by R. S. Carter, Malden & Melrose Gas Light Co.; "High-Pressure Distribution of Gas," by A. W. Grant, Jr., Koppers Co.; "Handling of Coke and By-Products," by A. M. Beebe, general superintendent, Rochester Gas & Electric Corp.

The course in Fuel and Gas Engineering at Technology is now in its third year. During the first two years, nine graduate engineers completed the work and are now employed in various branches of the fuel and gas industries. This course is open to graduate engineers and consists of nine months' work at the institute, followed by six months' field work at stations which are located at the following plants: Cambridge Gas Light Co., Cambridge, Mass.; Edgar Station of Edison Electric Illuminating Co. of Boston; Lackawanna Works of Bethlehem Steel Corp.; Mineral Springs Plant of Iroquois Gas Co., of Buffalo, N. Y., and Bayonne Refinery of the Tide Water Oil Co.

The period at the institute is largely spent on those aspects of the subject that can best be learned in the classroom and laboratory. The field work, which consists of plant studies and testing of full-scale equipment in normal operation, is carried out under the immediate and personal supervision of an institute instructor.

SAN ANGELO GAS SUPPLY

SAN ANGELO, Tex, May 5—Assurance that San Angelo will have an ample gas supply for many years to come was given by officials of the Oklahoma Natural Gas Corp., who made an inspection of the company properties, in San Angelo and this section.

Confidence that no shortage of gas will be experienced during this generation was expressed, pointing to reports of experts that the potential supply will last for many years. While the concern has under contract 200,000 acres of potential producing lands, it was stated that the company prefers to buy gas from other producers.

NATURAL GAS MEN COMPLIMENTED BY MANAGING DIRECTOR FORWARD

By Alexander Forward*
Managing Director, American Gas Association

We have been consolidated but a brief period and naturally there were not only new acquaintances to make between the natural and manufactured gas industries but new ways of doing things to be appraised. I find nothing but a wholehearted spirit of co-operative effort in what we are all trying to do. The natural gas men, as the president has said, have brought into the association an inheritance of the spirit of the pioneer, and unafraidness to try the unknown. Into the natural conservatism of the manufactured gas industry there has been infused the leaven of progressive and aggressive viewpoint and out of that union comes the best of both, combining the hard learned lessons of our industry's history with the determination to advance fearlessly upon our tasks, problems and achievements.

I quite agree with the president that for this happy result of our recent amalgamation Chairman McGowen largely deserves the credit. He has done everything within his power to make the situation a success and has labored without reservation to unite our forces. President Fogg has fully demonstrated the same purpose in all of his committee appointments. On all occasions in the meetings of our Executive Board, where again there is no difference in attitude and purpose between natural gas and manufactured gas members, the association's vice president, Mr. Mullaney, your department's vice chairman, Mr. Meals, the officers of the various sections of the association, the members of your Executive Committee have all played every card face up on the table and there has not been a suspicion of cross-purposes between us.

We know that we have in gas the best, most reliable, most adjustable, most efficient fuel for all purposes in which heat is used in industry. You have heard the smoke nuisance fully discussed and I join in the congratulations to Dallas upon its distinction and its advantages as a smokeless city. The relentless economic forces of the times are working with the Department of Health throughout the land for the elimination of smoke. The manufacturer will find that he must turn to gaseous fuel and indeed many thousands of manufacturers have already turned to the use of gas even in cities where no restrictions are placed upon the discharge of smoke into the air.

Value of Laboratory

But in order to command this enormous industrial gas business we must see to it that the appliances used in our customers' plants are efficient. Our friends of the electrical industry have two fairy godmothers in the two large accumulations of capital and ability in the manufacturing field, for it is the manufacturers and not the operating companies that are mainly responsible for the rapid advance of the electric industry in the field of power. What the manufacturers have done in the electric industry the gas companies must do for themselves. A group of larger gas companies have financed a five-year program of research in industrial gas utilization which is now nearly two years on the way. Although it is impossible to buy the results of research in packages at so much a pound, or to calculate at any time what the return will be, we have already made notable progress and have evolved appliances of great value to our industry and to those industries using them. Perhaps the contributors to this special research fund may at some time realize at least a partial return through royalties on the sale of appliances that have been produced, but if no part of the money is ever returned, they will have contributed it cheerfully. The fund is being administered by the association through a special committee which will see to it that no royalty consideration shall be allowed to interfere with general use of any development by the industry as a whole. It is a pleasure to record the thorough active and constructive interest taken in this work by Mr. Burr of Columbus and Mr. Palmer of Buffalo, the natural gas members of the committee administering this fund.

It will interest you to know something that has never before been stated anywhere. The Industrial Gas Research Committee, following consolidation of our two industries, determined upon a survey of the natural gas companies to learn what are their immediate problems in industrial gas utilization, in the same manner as a survey was conducted by the same committee in the manufactured gas field at the outset of this research activity. The survey of natural gas companies has produced no suggestions not already in possession of the committee from the manufactured gas field. Nothing could more clearly demonstrate the fact that our purposes and needs are identical and that we are working along the right lines.

The establishment and continued operation of this laboratory, its growing favor in the industry, with official agencies and with the public, the construction of the new building now in progress, all testify to the resolute purpose of the gas industry to carry through its program of improvement in the efficiency and safety of domestic gas-burning appliances. There may be differences of opinion as to the commercial use to be made of the laboratory's operation, but there is no difference of opinion either as to the permanency of the laboratory's activities or as to the able and impartial administration of its affairs by its director, Mr. Conner, and by its managing committee, whose chairman from the beginning has been R. W. Gallagher, the last full year president of the Natural Gas Association of America.

The demonstration of the spirit of research in our industrial gas utilization program and in the laboratory, both in the research work which must necessarily precede the adoption of national requirements for testing, and in the mixed gas program already mentioned here, is further demonstrated along nontechnical lines. The Commercial Section of the association has thoroughly organized committees to promote the use of gas in every direction afforded by appliances on the market. In each case the committee is engaged in research, for the commercial men know as well as the technical men that all progress is based upon exact knowledge of present conditions. The Commercial Section has thoroughly comprehensive programs for sales stimulation. At the instance of the Commercial Section, our Executive Board at its last meeting gave approval to a plan of salesmen's training. The actual work will be carried out by a concern with long experience in the line of preparing and executing courses in salesmanship, but it will be done under the direction of the association's committee. It is necessarily preceded by the collection of large amounts of information throughout the country of existing sales methods. This is research. On this committee, as well as on every committee of the Commercial Section, natural gas has full representation.

Need for Statistics

I feel that I really ought to say a word about statistics in addition to what has already been said by Mr. McGowen. As a matter of fact, no modern industry can exist or play its part in the economic

(Continued on Page 159)

*Before Natural Gas Department, American Gas Association, Dallas, Tex.

SHOULD CONCENTRATE ON GAS SALESMANSHIP

That the future of gas industry lies in development of its product as fuel was the opinion expressed by Thomas N. McCarter, president of Public Service Corp. of New Jersey, in an address before the Eastern States Gas Conference. Mr. McCarter emphasized that gas is fuel in most convenient, cleanly, efficient and adaptable form and that there exists a possible future market for gas fuel of tremendous size and importance.

"The task now before the gas industry," Mr. McCarter said, "is the perfection and adjustment of its service, to make possible occupancy of the fuel field to an extent not hitherto believed possible. It must be remembered that the gas industry deals with coal and so ultimately with power, that today the world is making inefficient use of coal and that there exists an opportunity for increasing efficiency as full of possibility as those that confront the electrical service.

"The good record already made by gas in many industrial processes makes time ripe for a rapid and wide extension of use of gas in industry. In respect to a great deal of prospective gas business we are pioneering in unexplored territory and the merits of the product must be sufficiently well established in the public mind to obviate the necessity of meeting, in some measure, completion on a cost as well as on an efficiency basis.

"Of the lines of effort on which the gas industry should concentrate, I believe the most important to be salesmanship," Mr. McCarter continued. "Every man acquainted with the current situation knows that in gas we have for sale the best fuel that can be produced, yet the average person, not interested in industry, believes it to be in a slumbering condition, hard pressed on all fronts by the increasing use of electricity and oil. Under this condition of the public mind it is our job to 'sell' the gas idea, much as the electric idea has been sold."

ARKANSAS GAS SALE

EL DORADO, Ark., May 5.—Sale of the holdings in Arkansas of the Ouachita Natural Gas Co., owned by the S. Hunter estate of Shreveport, La., to the Industrial Gas Co. at Bastrop, La., is announced here.

The Hunter estate is said to have paid $1,300,000 for the property six months ago when the holdings and the gas franchise of the El Dorado Gas Co. were bought from S. R. Morgan and associates. The property included a 100-mile pipe line from Monroe, La., to El Dorado and Camden, Ark. The company also claims to hold under lease approximately 50,000 acres of gas land near Monroe.

GAS TO TREASURE ISLAND

GALVESTON, Tex., May 5.—Natural gas has been connected to the plant of the Galveston Gas Corp. here, marking the advent of natural gas on the Treasure Island. The firm plans to use the gas for fuel in manufacturing artificial gas, pending an agreement as to rates. The company is asking for an initial rate of $2.29 per 1,000 cubic feet, while a chamber of commerce committee has recommended an 80-cent rate.

Employes Performance in Gas Service

Unique Responsibility Rests Upon Personnel of Natural Gas Companies. Twenty-four Hours' Obligation to Duty

By R. W. Hendee*
Oklahoma Natural Gas Corp.

No doubt most of you are at present, or have been sometime during your experience, gas company empolyes, and no doubt you could elaborate at length on your own personal performances in the industry of your choosing.

But what is to be considered as "group performance" of the hundreds of specialists making up our modern gas companies? The pipe-liner, the production man, the meter man, the truck driver, the warehouse man, the city plant man and a hundred others are specialists in their line and the sum of their individual performances creates the tremendous natural gas industry. The group performance of all employes may be considered collectively under the one general and familiar term "Service."

Everyone will agree that we are living in an age of service. It makes no difference what the business or what the commodity sold, service must maintain if the company is to exist very long, and the one which gives the best and the most service, other things being equal, is the one which will hold the balance of power.

In our own industry, the word service carries a dual meaning—first of all, that service which maintains a 24-hour even gas pressure at the burner tips which is fundamentally dependent upon the field men, and secondly that personal service which is rendered by actual contact between the employe and the served public, and this usually devolves upon the distribution force. Why have we placed gas service first? Because it is evident that without it there would be very little hope of establishing good feeling towards the company, even with the very best efforts of the service men, cashiers, complaint men and city managers. They could have the finest force known to gas distribution, but without plenty of gas on tap at all times, there would be small chance for the good will of the consumers.

Public Relations

We have all heard of service and complaint men whose duty it is to answer and adjust the slightest detail that may make for the more efficient use of gas or a better feeling towards the utility. Practically all the large companies have public relation men whose sole duty it is to sell the company to all of the consumers, both through advertising and by talks before various meetings and by personal contact. Contract clerks and cashiers are selected for their personalities and manner of meeting the constant stream of people who peer over the counter at them. Then come the city or office managers, who stand as the last effort of the company to maintain an even tenor of feeling by the public towards the company. So we find that these employes, along with many others in the distribution departments, perform daily towards an end of service to their clientele.

But what of all the various specialists connected with the field departments who never come in contact with the public which they serve from the far distant gas fields? All of you have read of and many can tell interesting stories about the performances made by gas company field men in order to maintain that 24-hour, 100 per cent service, necessary alone in our industry. There is no business, no industry where it is more vital to always maintain constant service. Water may be shut off from a city temporarily, electric light and power service may be interrupted, transportation may cease, but when the gas supply is shut off you have a calamity. To avoid such a thing, picture if you can a broken main line, always on a cold day, stormy night, telephone calls to a division headquarters, men getting out of bed, the repair gang on their way, more telephone calls to the pressure dispatcher, switching of lines, a quick repair and the city never knows it. Practically every magazine dealing with the industry tells similar stories from time to time and those of you who have been "through the mill' read these articles with a much greater thrill than the article on the next page which deals with the latest theory of molecular activity.

Twenty-Four Hour Service

There is some discussion in other industries as to whether the employe's time before and after work belongs to the company for which he is working. In the natural gas industry you will find men ready to perform at any time during the whole 24 hours. They consider that they must be on hand or at least within call upon the shortest notice. Likewise a new feeling predominates among companies that are trying to create good will, which is, that an employe is responsible to the company at all times and that he must govern his actions, especially in public, accordingly; for to the part of the public with which he comes in contact, he is the company.

A real gas man must go farther in his attitude toward his job than hours of service or amount of the pay check. He must realize that he is a part of an organization that has assumed a most serious responsibility toward the public which his organization serves. This real gas man realizes that an interruption in the flow of gas on a bitter cold night may put the health—yes, even the lives—of hundreds or perhaps thousands of consumers in jeopardy. This real gas man must make self secondary. He must submerge his own personal pleasure and convenience to the bigger idea—the welfare of the consumers is in his care.

There are many angles to the problem of responsibility to consumer, to company and to the public welfare. It is this broader conception of service which causes men to jump in and work night and day to snuff a blazing gas well, whether it belongs to their company or not. There comes to my mind now a case of a well in Oklahoma that somehow got on fire as they were pulling the tools. It was making 80,000,000 feet a day. A side gate was open, so there was a flame shooting out to the side in addition to the roaring tower of flame shooting straight toward the sky. It did not belong to our company, but, so long as it was open, it was wasting gas from a field in which our company had production. While men employed by the company owning the well gave up and went home to their rest, our men—not just one or two, but an entire crew—toiled in the deafening roar and smothering heat for more than 70 consecutive hours until the flame was extinguished and the well shut in. This is what is meant by the broader conception of service — an unselfish attitude of enthusiastic co-operation in a case which involved gas conservation regardless of ownership of that gas.

Co-operation Essential

But still another performance on the part of all employes must exist and without which service to the public cannot maintain. It is something that should be the very heart of all industries and in the daily life of every man towards his fellow. It is co-operation. You may have an abundant supply of natural gas, adequate line capacity to bring it into the city and an efficient field force to see that this is carried out; you may have the best distribution systems obtainable and likewise an excellent force of men to handle the distribution problems; all of your other departments may be the last word in their line, but unless they are all pulling in the harness in the same direction, and together, you cannot expect to render service. It is a positive axiom that "a house divided against itself cannot stand" and further, "United we stand, divided we fall." It seems so strange that employes of a company cannot realize the tremendous value of co-operation, not only to their company, but to themselves. For, without a doubt, wholehearted and unhesitant co-operation between all departments brings success. A group of people all working together towards an honorable end cannot be hindered in their progress. How much more pleasant it is to work daily in an atmosphere of co-operation than in an organization where, as the saying goes, each person "passes the buck" to protect their own skins. How important it is then, that, besides the actual performance of our daily work we follow the teachings of the old Roman scholar, Marcus Aurelius, when he said, "We are made for co-operation, like feet, like hands, like eyelids, like the rows of the upper and lower teeth and are all working together to one end; all laborers and co-operators in the things which take place in the universe."

*Before Natural Gas Department, American Gas Association, Dallas, Tex.

Gas Sands in South Texas Fields

Pools Located on Uplifts of an Anticlinal Nature. Production Is Governed Almost Entirely by Sand Conditions

By J. Boyd Best*
Houston Oil Co. of Texas

In preparing this article, much of the information and especially the pool histories has been taken from the reports of Fred P. Shayes, Phil F. Martyn and A. S. Henley, chief geologist of the Houston Oil Co. of Texas. The outline of the pools and general conditions is a condensation of a paper by Mr. Henley published June 16, 1927, in The Oil and Gas Journal, but as it is suited for the purposes of this paper, the writer is taking the liberty of reproducing parts of it for the purpose of furnishing a general outline of development in South Texas.

Practically all of the commercial gas so far found in Southwest Texas is in an area beginning at Laredo, in Webb County, Texas; thence down the Rio Grande River to Rio Grande City; thence easterly to the Gulf of Mexico; thence along the coast to the mouth on the San Antonio River; thence westerly to northern Live Oak County; thence southwesterly to the point of beginning. Outside of this area there is some commercial gas production in Bexar and Medina Counties around San Antonio.

In this area are the producing gas fields of Refugio in Refugio County, White's Point in San Patricio County, Saxet in Nueces County, Lucas in Live Oak County, the Three Rivers district consisting of several small pools and scattering gas wells in Live Oak and McMullen Counties, Kingsville in Kleberg County, Driscoll in Duval County, Cole-Bruni in Duval and Webb Counties, Carolina-Texas in Webb County, Albercas, St. Albans, Henne-Winch-Fariss Pools in Webb and Jim Hogg Counties, and Jennings in Zapata County. Besides this, some gas has been produced from near Edna in Jackson County, an area west of Mathis in San Patricio County, government wells in Duval County, the pools along the escarpment south of Mirando City consisting of the Mirando City, Schott, Walcott, Midojuelos and Aviator Pools in Webb County, and Randado and Alworth in Jim Hogg County, and the exhausted Reiser Pool in Webb County.

Geological Structure

The area as outlined in this article is located on the Gulf Coastal Plain. The general structure can best be explained by quoting from Professional Paper 126 of the United States Geological Survey, by Alexander Duessen: "When the material that formed the beds of rock now exposed on the Coastal plain of Texas were originally deposited in the sea, they lay practically horizontal, but since their deposition, the inland part of the region has been gradually elevated, and they have thus been tilted. The beds, therefore, instead of being horizontal, are now slightly inclined toward the Gulf. Since they were elevated above sea and tilted, these beds have been considerably eroded, so that the surface of the Coastal plain no longer coincides with the surface of the uppermost layer of rock, but bevels all the gently inclined layers at a slight angle. From place to place, different sheets are exposed to view. The lowermost formation is exposed at the greatest distance from the coast; the uppermost at the coast."

Roughly, the dip of these formations from San Antonio to the coast probably averages between 45 and 60 feet to the mile with the exception of the Reynosa and younger formations near the top and adjoining the coast, which formations probably do not dip much over 20 feet to the mile. Thus the formations near the bottom of a 5,000-foot well should outcrop at the surface about 80 or 100 miles farther inland, and shallower formations at a less distance.

Reynosa Escarpment

A prominent feature of this coastal plain both topographically and geologically is the Bordas or Reynosa escarpment. The Reynosa formation contains some comparatively hard formations consisting of limes and gravel beds cemented with lime forming a conglomerate. This formation forms a seaward sloping plain, the formations, as explained, sloping toward the Gulf at a greater angle than the surface. The western boundary of the Reynosa consists of a westward facing slope known as the Bordas or Reynosa escarpment. This escarpment has

(Continued on Page 104)

*Before Natural Gas Department, American Gas Association, Dallas, Tex.

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A Major Enterprise in Natural Gas

Amarillo-Denver Line One of the Biggest Projects of Its Kind Ever Undertaken. Properties and Markets Involved

By Tolbert R. Ingram

COLORADO SPRINGS, Colo., May 7. The natural gas pipe line from the Amarillo Field in the Texas Panhandle to Denver, Colo., upon which actual construction work commenced last December and which is nearing completion stage, stands out as one of the major enterprises of the natural gas industry. It involves several features which places it in the front rank, if not at the very head, of the big projects of its kind in this country. One of these is the unusually large tract of gas-producing territory brought together into a single unit to assure a long and dependable supply of natural gas for the communities and industries to be served. Another is the length and size of the line which, it is believed, is not exceeded by any other natural gas line constructed up to this time. Incidentally, it involved the placing of one of the largest single order for 22 and 20-inch pipe and other features which lifted it out of the realm of an ordinary pipe line project.

The first official announcement that a definite decision to build the line and that contracts had been signed was made the fall of 1927. Negotiations with that end in view had been in progress for many months and involved many interests and numerous ramifications that had to be harmonized before it could be definitely determined whether the projected enterprise was feasible. Altogether, over a year's time was required to work out all the problems involved, negotiate the necessary contracts, complete the engineering work and build the line.

Difficulties Faced

In order to appreciate the difficulties faced by those who inaugurated the enterprise, it is desirable that several pertinent facts be pointed out. The cost of the project, including gas properties, pipe lines, compressor and absorption plants, equipment and everything necessary to make it a going concern, is estimated at $25,000,000. In order to realize a reasonable income on an investment of that sized, it was necessary to be assured not only of an enormous supply of gas, but of sufficient reserves to make the supply dependable for a long period of time, and a reasonably certain market for the product for many years in the future at a price that would permit the amortization of the investment. When it is considered that the market was 340 miles away from the gas supply and that the necessary pipe lines would take the gas into the center of a state in which the United States Geological Survey estimates there are the largest coal reserves in any state in the Union, it is apparent that the project was one requiring unusually careful investigation and definite assurances before it could be undertaken.

Ditch in valley and south ascent of Purgatoire Canon.

Extent of Gas Properties

The gas properties comprise more than 350,000 acres of gas rights in a single block in six counties in the Amarillo Field upon which are 25 wells with an aggregate open flow capacity of 625,000,000 feet of gas per day, the wells averaging 25,000,000 feet each. In addition, gas in almost as large a quantity was cased off in these wells while drilling for oil. Additional wells will be completed by the end of the present year. This is equivalent to approximately 15 townships, or 346 square miles of territory held in reserve to maintain the gas supply as needed. This is believed to be the largest area of gas properties held in a single unit in the country. The gas is high in heating units, testing 950 to 1,000 B.t.u. per 1,000 cubic feet, and free from sulphur and has a sweet odor which is easily perceptible, but is not unpleasant. The dependability of the gas has been determined by scientific computations over several years made up from the rock pressure of wells at completion and subsequent intervals, analyzing of the gas, and study of all the data that could be obtained.

The gas properties are held by the Southwestern Development Co., which is jointly owned by the Producers & Refiners Corp. and the Mission Oil Co. The Cities Service Co., through its Empire Gas & Fuel Co., contributed 16,000 acres to the block. This arrangement permitted the holding of the reserves in a single unit under one ownership and assured the development of the properties only to the extent that additional supplies of gas were needed.

Available Markets

The next step was to determine the available markets for the gas. The Colorado Fuel & Iron Co. operates at Pueblo the largest steel mills in the West and the largest industrial concern in Colorado. This company produces from its own mines one-third of all the coal mined in Colorado, a very considerable portion of which is used in its own mills. A contract was made with this company by which it agreed to use a large quantity of gas. Without this contract, it was not considered feasible to construct the line. The use of natural gas in the steel mills is expected to result in improved processing methods, particularly in the open hearth department, making it pos-

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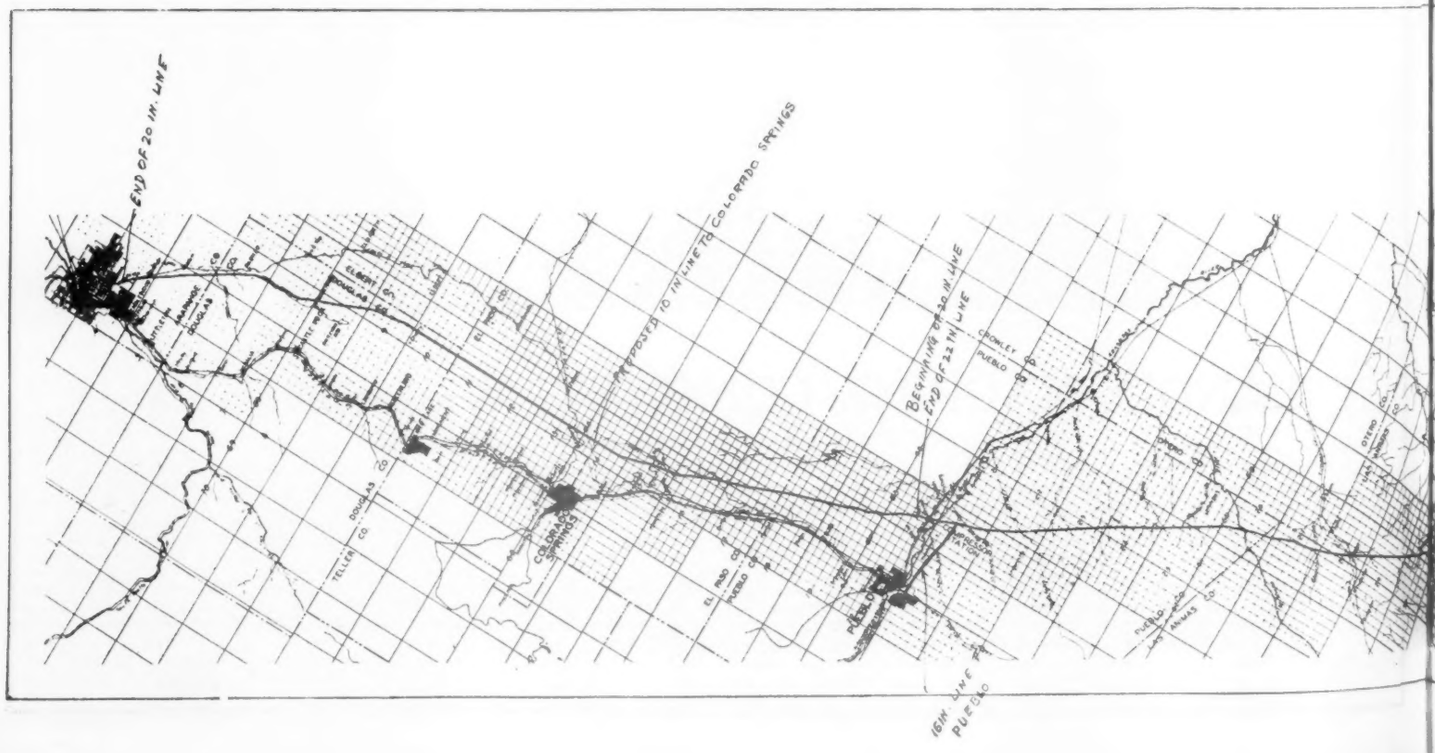

Denver Line Great Engineering Feat

Difficult Problems Encountered in Construction of Gas System From Panhandle Fields to Colorado City

By Tolbert R. Ingram

COLORADO SPRINGS, Colo., May 7. The main line of the Amarillo-Denver gas line starts at a point approximately 12 miles east of the southeast corner of Moore County, Texas, and runs due northwest through Moore, Hartley and Dallam Counties, passing 1 mile to the north of Dalhart, and goes out of Texas at the northwest corner of Dallam County. The first division, comprising 86.3 miles of 22-inch pipe, being that part constructed for the joint interests by the Canadian River Gas Co., ends 2 miles northwest of the Texas boundary and 7 miles northeast of Clayton, N. Mex. From that point the line of the Colorado Interstate Gas Co., consisting of 22-inch pipe for 149 miles and 20-inch pipe for the last 105 miles, goes in a generally northwesterly direction to a point 6 miles east of Colorado Springs, where it turns due north for about 25 miles when it again bends in a northwesterly direction to the southeastern limits of the city of Denver. The total distance of the line is 340.7 miles, of which 254 miles is owned by the Colorado Interstate Gas Co., and the remainder by the Canadian River Gas Co.

The line out of Amarillo runs mostly through a plains country, but in New Mexico and southern Colorado the area is more broken and is cut by rocky canons, rivers, arroyas, and small draws and is a much more difficult terrain. The principal canons negotiated were the Travesser in New Mexico, the Cimarron near the Colorado-New Mexico line, and the Purgatoire canon in Las Animas County, in southern Colorado. While there were several small streams to cross, the principal ones were the Huerfano River in Las Animas County, Colorado, and the Arkansas River, east of Pueblo. The formations range from light sand to the hardest granite, and considerable rock work was required.

Engineering Work

All of the engineering work was done by Ford, Bacon & Davis, Inc., which had offices at Colorado Springs and Amarillo. The engineering staff that worked out the details was in the field the middle of last summer and the required ditching was profiled for rock before bids were received. The size of the ditch was 30 by 52 inches.

One of the interesting things done after the completion of the engineering work was the sampling of the soil. These samples were taken at intervals of 1,000 feet for the entire distance of the line and sent to a laboratory in Denver where they were analyzed. The knowledge of the top soil and subsurface formations thus gained was used to determine the destructive content of the various kinds of soil to steel pipe so that the proper thickness of paint could be applied to the pipe according to the soil and moisture, and to facilitate ditching. While the same method has been used in similar work in Louisiana, this is the first time that it has been employed on so large a scale.

Ford, Bacon & Davis, Inc., called for bids for the ditching, painting, laying of the pipe and backfilling last October and eight bids were submitted. The contracts were awarded to the Oklahoma Contracting Co. of Dallas, Tex., for the Texas end of the system, and to Williams Brothers, Inc., of Tulsa, for the line from Clayton, N. Mex., to Denver. Williams Brothers, Inc., opened offices at Colorado Springs with D R. Williams in charge. Subsidiary contracts were let for stringing the pipe and other phases of the work.

Lines in bed of Huerfano River ready for laying.

Ahead of Schedule

At the present time 300 miles of the 340 miles total length has been laid and backfilled. This is between two and three months ahead of the scheduled time for completion and makes an excellent record when it is considered that work began on December 13, 1927, in the middle of the winter. While favorable weather was one of the factors reducing the time employed in construction, other factors were more important. The construction methods were laid out to permit the widest use of machinery that was possible and all hand labor was eliminated wherever it could be done away with. Ditching machines were used to do the trenching except for a few miles of rock work. Pipe was strung with trucks and trailers except in the bottoms of the canyons where they had to be snubbed down the canon walls, and the pipe was handled by laying cranes except in the canons. Each of these cranes did the work of approximately 24 men. Mechanical backfillers were used for refilling the ditches and all the equipment employed was of the heaviest nature adapted to the work. The ditching machines, of which seven were employed on the northern division, and two on the southern, travel 2,500 to 4,000 feet in 12 hours. The ditchers were operated 24 hours a day each day in the week and managed to keep about 5,000 feet ahead of the layers.

Transportation Problems

The transportation problem was one given considerable attention. The route of the pipe line for long distances was through unsettled country and it was necessary in many instances to build roads through the canons or over difficut terrain, to clear rights of way, etc. Twelve miles of the route was through

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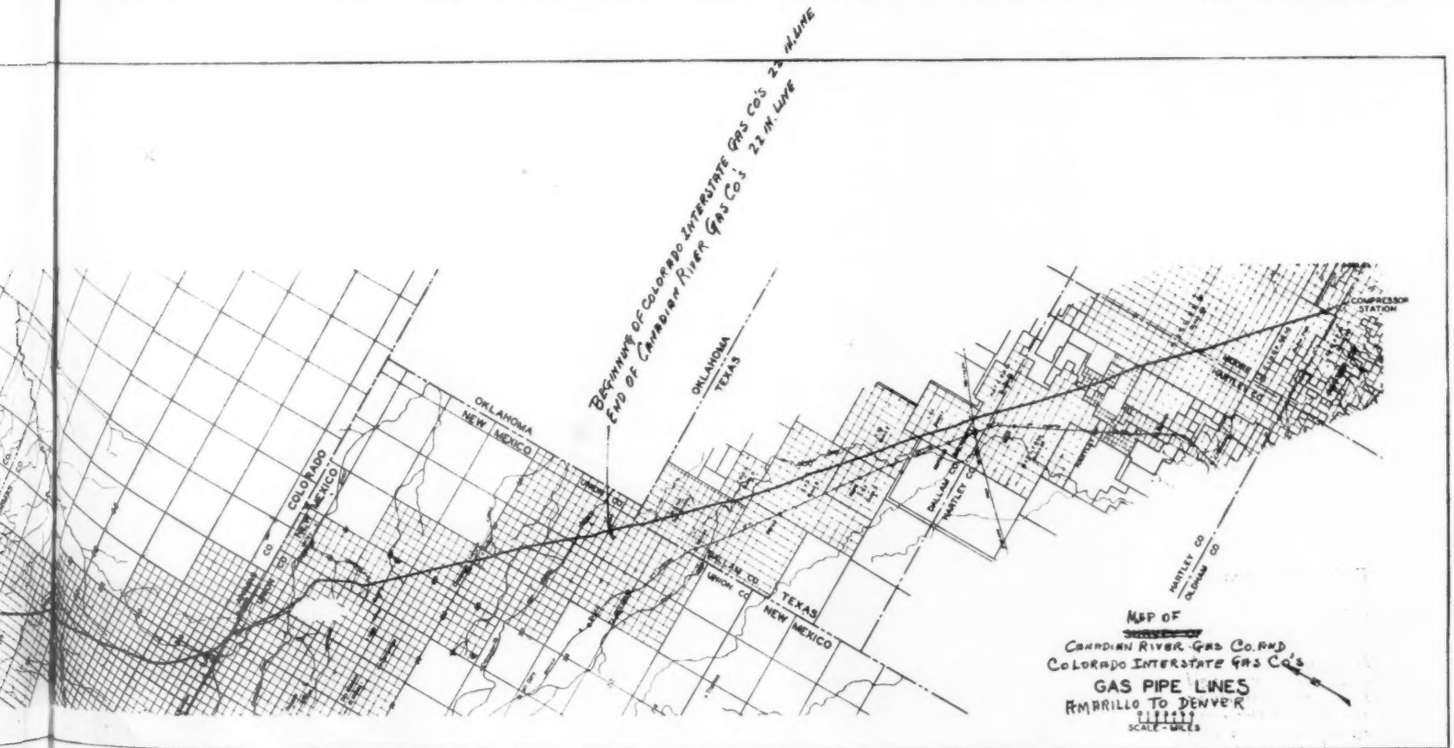

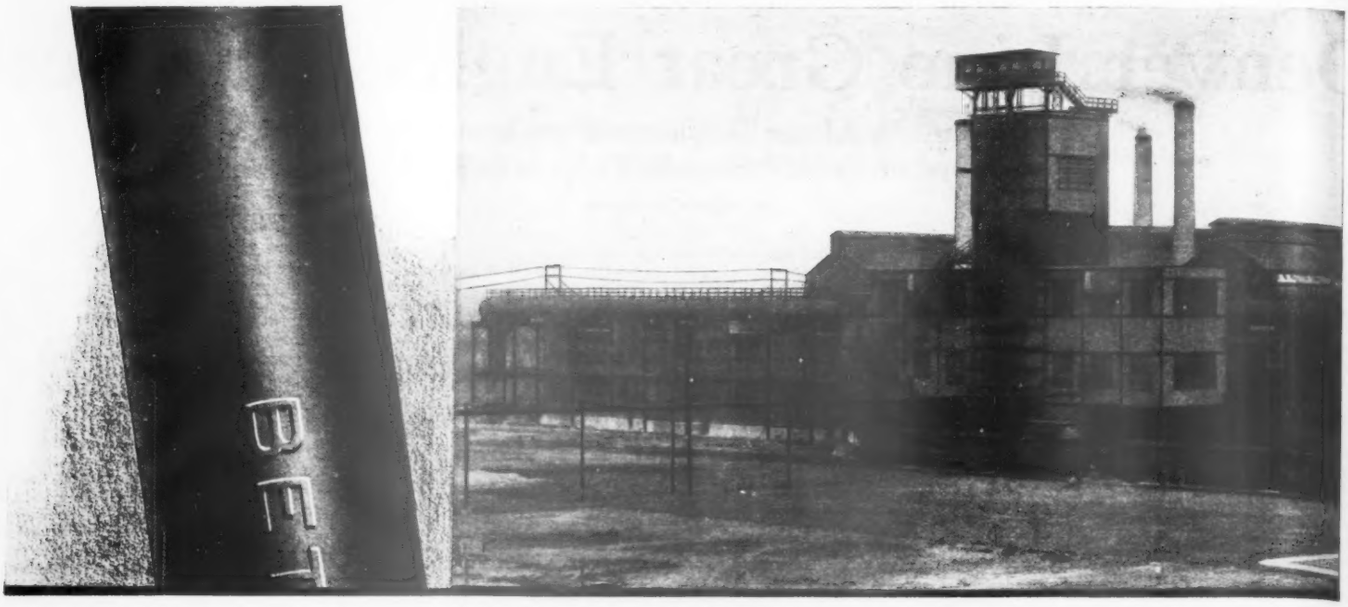

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Accurate Estimates of Gas Reserves

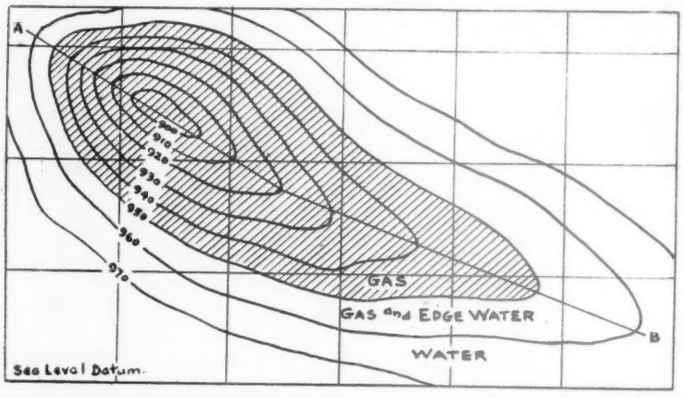
Computation for Economic Needs Subject to Unseen Gas Field Factors. Gas Terms Clarified

By C. P. Parsons
Superintendent, Cement Oil Field and Chickasha Gas Field for Magnolia Petroleum Co.

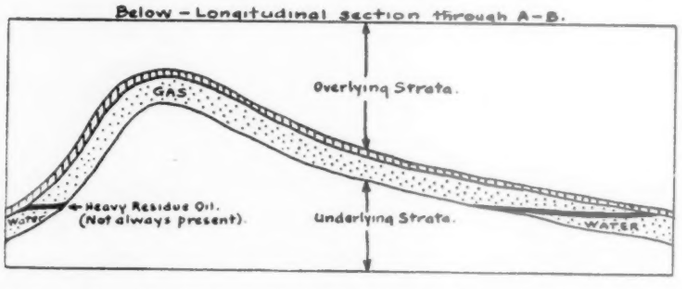
With increasing industrial and domestic use of natural gas as a very economical and efficient fuel and with increasing huge capital commitments of super-merged natural gas utilities there is consequent increased need for accurate estimations of gas reserves.

Such estimations are generally needed by municipalities and utilities for checking up possible supply; by national and state government for determination of reserves; by gas carriers and operators for determinination of values, possible return on investment and for amortization purposes; by banks and others for appraisal purposes; and by research effort for scientific data.

It is readily seen that those needs can be generally classified as either scientific or economic. The former is concerned chiefly with the exact amount of reserve gas in a reservoir while the latter, although interested in the former, is chiefly concerned with the amount of gas that reasonably can be expected for sales "delivery" into carriers' pipe lines. Hence in this article the term "deliverable gas is used in economic reserve estimates.



SUB-SURFACE CONTOURS OF A USUAL FORM OF GAS RESERVOIR.



The basic methods of computing estimates for both scientific and economic needs are the same but computation for economic needs runs the gamut of subjection to various unseen gas field factors that influence the gas in its travel from the underground reservoir to the field sales delivery meter.

Estimate Making

It is the purpose of this article to consider concisely the methods of estimate making and especially the unseen gas field variables to which economic estimates must be subjected; also to attempt clarification of some gas terms that are now confusing.

For any degree of accuracy in an economic estimation of reserves the task should be put in the hands of competent gas engineering effort that also is thoroughly familiar with practical gas field conditions such as edge water influences, etc.; also with a working knowledge of subsurface geology. Without the backing of that collective knowledge an economic gas reserve estimate is of little value to those interested in gas from the standpoint of income or actual field delivery.

The accuracy of computed results in all problems of science depends on the accuracy of observation and, as in the case of unseen gas field conditions, visualization measurements upon which the computations are based. Pure science has brought to us basic understanding of the extreme expansibility and compressibility of gases and has established certain laws governing pure computations, essentials to reserve estimating.

By comparison with liquids, gases readily show their extreme characteristics. Water, for instance, when subjected to a pressure of one atmosphere approximately contracts one-twenty-five thousandths of its volume while gas contracts one-half. Remove the one atmosphere of pressure and the gas will readily expand to its original volume. Such extreme compressibility and expansibility of gas due to pressure must be understood. For pure computation it is covered by Boyle's law of physics which says, "Temperature remaining constant, the volume of a body of gas varies inversely as the pressure" which has been generally accepted as a basic starting point in gas reserve estimating. The law must be understood and applied not only from the standpoint of the volume varying "inversely as the pressure," but also from the standpoint of the accompanying direct variation of density. In gas under high pressure there is a deviation from Boyle's law which must be considered in reserve estimating. Any reserve computations based on Boyle's law and made on the basis of high gas pressure in the early life of a gas field would, without consideration of deviation, throw the reserve estimate too high.

There also are observation factors of temperature and gravity for which corrections must be made. "Delivery," which is measured withdrawal of gas, usually is corrected to a temperature of 60 degrees Fahrenheit and gravity to .6. For basic computation, temperature is covered by Charles' law which may be stated thus—"the pressure remaining the same, the volume of gas varies directly as the absolute temperature."

Methods

There are two methods in general use for estimating gas reserves. One of them may be called the "shut-in pressure—delivery" method; the other, "porosity—acreage" method. Their names imply the principal factors.

The former is used when sufficient delivery of measured gas has been taken from a natural gas reservoir to cause an appreciable drop in shut-in pressure readings. Computation is based on an analysis of that drop in shut-in pressure as an effect and the delivery as the cause. Those two factors being apparently accurate observation measurements of meter and gauge could proceed readily into a tentative reserve estimate in accordance with Boyle's law. That law would decree in the case of a drop of 10 per cent of the original shut-in pressure, without considering deviation, that 10 per cent of the total original deliverance volume of gas in the reservoir has been taken out. But here is where the factor of deviation and the unseen gas field factors that influence shut-in pressure have to be applied for a final estimate. Those factors are described later in this article.

The other method, "porosity—acreage," is based on the porosity of the gas-bearing stratum, the thickness and breadth of the stratum and the shut-in pressure readings. Computation for deliverable gas is based on cubic feet of pore space of the reservoir times the number of atmospheres-plus delivery pressure base. Though not capable of the accuracy of the "shut-in pressure—delivery" method, due to unseen factors, it is the only method now available for reserve estimating in the early stages of a field when there is no appreciable decline in shut-in pressure. Later it can be used to check against the "shut-in pressure—delivery" method. In this method there also are unseen factors that must be considered and a working knowledge of subsurface geology is particularly necessary for determining the acreage factor.

In both methods with a statement of the final estimate there should be mention of the pressure base of the deliverable gas, also of the temperature and gravity basis.

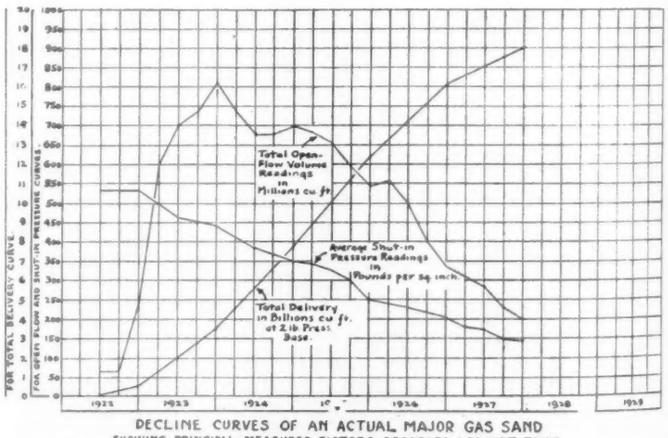
Both of those methods are generally accepted as being scientifically and practically sound and capable of close accuracy but the degree of accuracy is dependent upon the accuracy of the observation or visualization measurements that represent the conditions of the gas actually as it is in unseen reservoirs and influenced by unseen factors. Of course, "unseen factors" does not mean that they cannot be understood on an observation basis but in natural gas nature has certainly handed us a mean, migratory package from her generous bag of tricks.

Those unseen conditions, together with an attempt at clarification of some applied terms that are now confusing and connected with estimate making, will be considered in the remainder of this article.

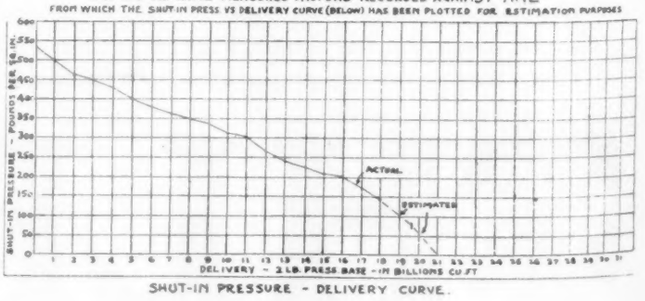
Confusing Terms

Recoverable Gas vs. Deliverable Gas: "Recoverable" gas, the term generally used in estimated gas reserves, is not definite enough for estimates to be used for economic determination of values, which actually should be based on "de-

(Continued on Page 156)



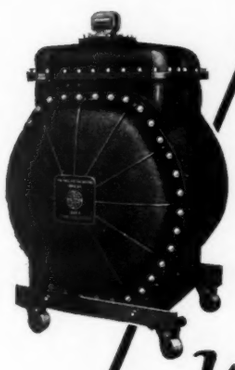
DECLINE CURVES OF AN ACTUAL MAJOR GAS SAND
SHOWING PRINCIPAL MEASURED FACTORS RECORDED AGAINST TIME.
FROM WHICH THE SHUT-IN PRESS VS DELIVERY CURVE (BELOW) HAS BEEN PLOTTED FOR ESTIMATION PURPOSES



SHUT-IN PRESSURE - DELIVERY CURVE.

IRONCASE

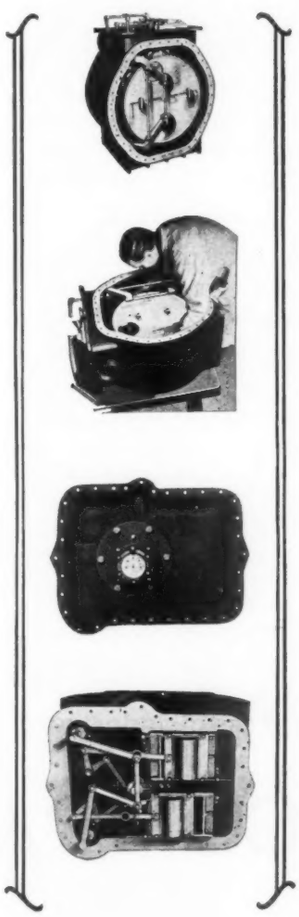
Meets the Greater needs of gas Measurement with New sizes of large capacity Meters



For Industrial and Drilling Wells, Large Capacity, High Pressure, Low Pressure and Vacuum Service

In Which

METRIC METERS



Capacity is increased with no increase in weight.

Capacity is increased with no increase in number of revolutions per foot of gas measured.

Slide valves and tin meter type diaphragms are employed on essentially the same principle as in tin meters.

Timken bearings are used on crank step, crank stand and two flag steps.

Alemite lubrication is provided and meters may be lubricated from outside while meter is in operation.

Lighter valve covers which eliminate friction and squeaks, without sacrifice of wearing qualities, are used.

A great improvement over 100 B and 200 B Ironcase Meters, which they displace, these new sizes represent an important achievement in the history of Metric Metal Works and of the entire gas industry.

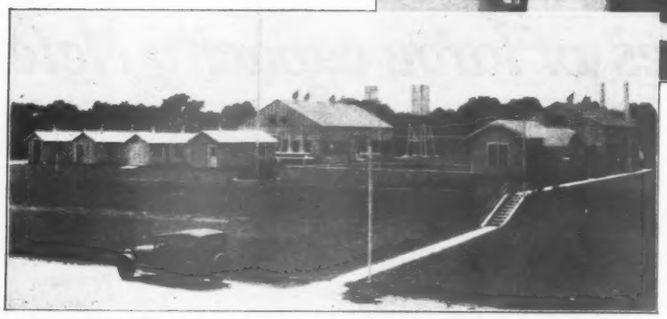
The new Bulletin No. 300 B will be sent upon request.

All High Pressure Ironcase Meters are badged at maximum working pressure (not test pressure). This means that for safety they are actually tested to a pressure twice as high as they are badged.

WESTCOTT & GREIS, Inc.
Sales Service
DALLAS TULSA LOS ANGELES

METRIC METAL WORKS
of the American Meter Company, Inc.
ERIE - PENNSYLVANIA - U-S-A

Below: Owasso Plant, Oklahoma Natural Gas Company.



Above: Interior View of Owasso Plant, Oklahoma Natural Gas Company.

FOR INDUSTRIAL INTERIORS AND EXTERIORS —BITULUMIN REFLECTS LIGHT —PREVENTS CORROSION

Aluminum Paint Prevents Surface Breakdown From Ultra-Violet Rays— GIVES MORE LIGHT

Correctly made aluminum paints like Bitulumin are largely immune to destructive ultra-violet rays. They will outlast the best oil and zinc paints by two to one.

Bitulumin forms a protective coating of tiny aluminum flakes like shingles held firmly together by its moisture proof liquid vehicle. It is both light proof and weather proof.

Because Bitulumin deflects approximately 86% of sun rays it makes for cooler surfaces and in the case of tanks reduces evaporation.

Bitulumin although widely used for painting oil storage is equally efficient on tank cars, metal buildings, refinery equipment, still towers, water tanks, bridges, etc.

Bitulumin, put up in double containers to insure fresh mixing, is manufactured by Hill, Hubbell & Company, Manufacturers of a special line of paints and protective coatings for the oil industry.

HILL, HUBBELL & COMPANY

Manufacturers of

Highest Grade Oil Industry Paints and Pipe Line Coatings

Factories at SAN FRANCISCO and TULSA

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Bureau of Mines Statistics for the Month of March, 1928

PETROLEUM, PETROLEUM PRODUCTS, AND NATURAL-GAS GASOLINE, MARCH, 1928

According to reports received by the Bureau of Mines, Department of Commerce, from companies which operate gathering lines, production of crude petroleum in the United States during March, 1928, amounted to 74,465,000 bbls. This represents a daily average of 2,402,000 bbls., an increase over the revised figures of the previous month of 55,000 bbls. The major portion of this increase was recorded in the West Texas district, which showed an increase in daily production of approximately 50,000 bbls. over February. This increased output enables the State of Texas to become, for the first time, the leading producing State, with the possible exception of a month or two during the height of the Spindletop boom in the early part of this century.

Total stocks of all oils amounted to 609,561,000 bbls., an increase over the previous month of 5,808,000 bbls. This compares with an increase in stocks of all oils in February of 7,451,000 bbls. Stocks of crude at refineries increased approximately 1,250,000 bbls.; stocks of domestic crude at tank farms and in pipe lines, 3,444,000 bbls. Over half of the latter was West Texas oil; probably one-fourth was Seminole oil.

Imports of crude petroleum during March amounted to 6,845,000 bbls., the greatest amount for any month in two years. The major portion of this oil was received from Venezuela, although the increase in receipts of Mexican oil was also noteworthy.

Refined Products

Operations at refineries showed a further increase in March, when the daily average crude throughput was 2,327,000 bbls., an increase over February of 65,000 bbls.

Daily gasoline production was 943,000 bbls., an increase over the previous month of 20,000 bbls. Daily average domestic demand was 776,000 bbls., which represents an increase over February of 6.5 per cent and over a year ago of 7 per cent. Exports of gasoline showed a material increase over February. Stocks of gasoline continued to increase though at a reduced rate. The total on hand March 31, amounted to 40,229,000 bbls., an increase over February of nearly 1,500,000 bbls. At the current rate of total demand, these stocks represent 44 days' supply as compared with 46 days' supply on hand the previous month and 63 days' supply on hand a year ago.

The demand for kerosene was materially lower in March and stocks were increased. Fuel oil demand was brisk and stocks remained relatively unchanged despite increased output. Of particular importance was the decrease in wax stocks of 30,000,000 pounds, which brought these stocks to the lowest point since the early part of May, 1926.

Refinery data of this report were compiled from schedules of 320 refineries, with an aggregate daily crude oil capacity of 3,100,000 bbls. These refineries operated during March at 75 per cent of their recorded capacity as compared with 317 refineries operating at 73 per cent of their capacity in February.

Important Fields

The chief feature of the month from the standpoint of production by fields was supplied by West Texas, where the daily average production rose from 280,000 bbls. in February to 332,000 bbls. in March. This material gain in output enabled this district to eclipse the Seminole area in production. Practically all of the increased output in West Texas occurred in the Hendricks Pool of Winkler County, where a number of exceptionally large wells were completed during the month. A total of 68 producing wells were completed in West Texas in March, which had the unusually high average daily initial production of 4,200 bbls.

Daily average production at Seminole declined, as expected, although the 15,000-bbl. decrease was less than was anticipated. Completions in this field dropped off 50 per cent, which was the chief reason for the decline in output.

Production in both the Seal Beach and Panhandle Fields showed small declines during the month. Completions at Long Beach were nearly double those of February, with the result that daily average production showed a moderate increase.

Prepared under supervision of G. R. Hopkins, Head of Statistics Section, Petroleum Economics Division, H. H. Hill, Chief of Division.

ANALYSIS OF SUPPLY AND DEMAND OF ALL OILS (ALL DATA PRELIMINARY)

(Including wax, coke, and asphalt in thousands of barrels of 42 U. S. gallons)

	March, 1928	February, 1928	March, 1927	Jan.-Mar., 1928	Jan.-Mar., 1927
NEW SUPPLY:					
Domestic production:					
Crude petroleum:					
Light	65,896	60,076	65,435	190,238	185,609
Heavy	8,569	7,983	9,869	24,607	29,044
Total crude	74,465	68,059	75,304	214,845	214,653
Natural-gas gasoline	3,426	3,279	3,271	10,072	9,349
Benzol	238	217	226	681	643
Total	78,129	71,555	78,801	225,598	224,645
Daily average	2,520	2,467	2,542	2,479	2,496
Excess of daily average domestic production over domestic demand	342	385	437	402	448
Imports:					
Crude	6,845	6,036	4,434	19,026	13,129
Refined	1,135	1,054	1,027	3,354	3,724
Total new supply all oils	86,109	78,645	84,262	247,978	241,498
Daily average	2,778	2,712	2,718	2,725	2,683
Change in stocks all oils	5,808	7,451	8,365	22,399	24,386
DEMAND:					
Total demand	80,301	71,194	75,897	225,579	217,112
Daily average	2,590	2,455	2,448	2,479	2,412
Exports:*					
Crude	1,530	1,243	1,199	4,005	4,568
Refined	11,247	9,578	9,450	32,563	29,198
Domestic demand	67,524	60,373	65,248	189,011	184,346
Daily average	2,178	2,082	2,105	2,077	2,048
STOCKS (end of month):					
Crude:					
East of California:†					
Light	317,429	312,700	244,785	317,429	244,785
Heavy	50,670	50,640	45,325	50,670	45,325
California:					
Light	19,633	20,110	29,568	19,633	29,568
Heavy‡	94,484	94,797	87,856	94,484	87,856
Total crude	482,216	478,247	407,564	482,216	407,564
Natural-gas gasoline at plants	842	824	697	842	697
Total refined	126,503	124,682	136,222	126,503	136,222
Grand total stocks all oils	609,561	603,753	544,483	609,561	544,483
Days' supply§	235	246	222	246	226
Bunker oil (included above in domestic demand)	4,236	3,751	3,874	11,770	11,401

*Includes shipments to noncontiguous territories. †Exclusive of producers' stocks. ‡Includes fuel oil. §Grand total stocks divided by daily average total demand.

PRODUCTION AND GRAVITY

(Barrels of 42 U. S. gallons)

	March, 1928 Total	March, 1928 Dly. Av.	February, 1928 Total	February, 1928 Dly. Av.	March, 1927 Total	March, 1927 Dly. Av.	Average gravity
Seminole	9,747,000	314,000	9,540,000	329,000	9,684,000	312,000	41.0
Panhandle	2,239,000	72,000	2,266,000	78,000	3,655,000	118,000	36.0
Seal Beach	1,243,000	40,000	1,188,000	41,000	806,000	26,000	24.0
Long Beach	3,877,000	125,000	3,436,000	118,000	2,933,000	95,000	26.0
West Texas	10,305,000	332,000	8,119,000	280,000	2,390,000	77,000	....

STOCKS AT SEMINOLE

(Barrels of 42 U. S. gallons)

	Mar.,'28	Feb.,'28	Mar.,'27
Producers' stocks	386,000	414,000	285,000
Tank farm stocks	18,386,000	17,745,000	4,200,000
Total stocks	18,772,000	18,159,000	4,485,000

RECORD OF WELLS, MARCH, 1928

(Barrels of 42 U. S. gallons)

	Completions: Oil	Gas	Dry	Ttl. initial production	Av. initial production	Drilling March 31
Seminole	21	2	11	11,540	500	110
Panhandle	11	13	21	4,925	400	136
Seal Beach	2	..	..	200	100	2
Long Beach	11	..	2	20,900	1,900	174
West Texas	68	3	28	285,981	4,200	318

PRODUCTION OF CRUDE PETROLEUM BY FIELDS AND STATES WITH CLASSIFICATION BY GRAVITY

(Barrels of 42 U. S. gallons)

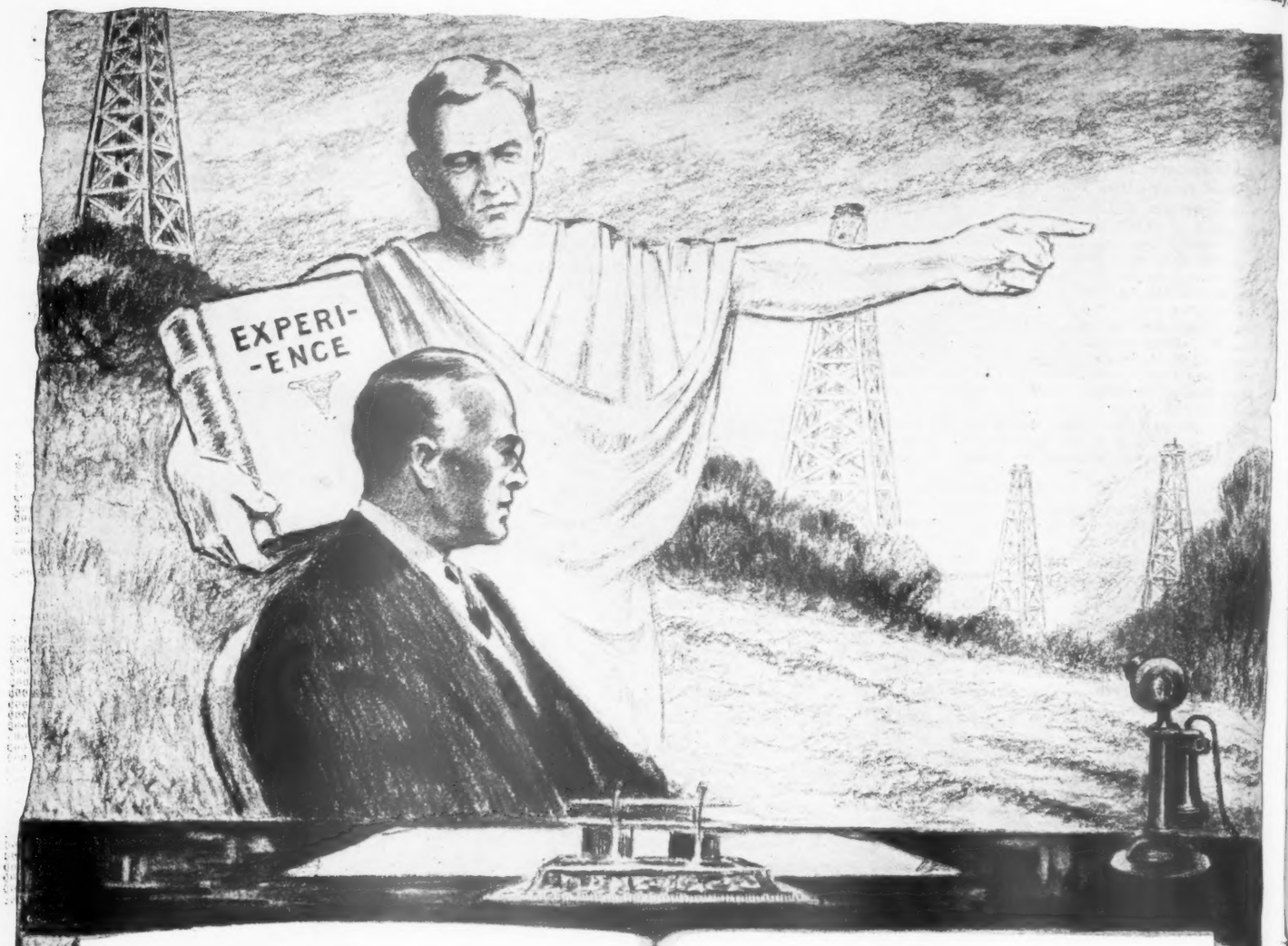
	March, 1928 Total	March, 1928 Dly. Av.	February, 1928 Total	February, 1928 Dly. Av.	Jan.-Mar., 1928	Jan.-Mar., 1927
Field—						
Appalachian	2,641,000	85,200	2,413,000	83,200	7,452,000	7,305,000
Lima-Indiana	145,000	4,700	132,000	4,500	401,000	466,000
Michigan	29,000	900	30,000	1,000	90,000	96,000
Ill.-S. W. Ind.	707,000	22,800	591,000	20,400	1,878,000	2,008,000
Mid-Continent	45,642,000	1,472,300	41,438,000	1,428,900	131,223,000	125,589,000
Gulf Coast	3,643,000	117,500	3,237,000	111,600	10,506,000	13,292,000
Rocky Mountain	2,540,000	82,000	2,180,000	75,200	7,111,000	7,593,000
California	19,118,000	616,700	18,038,000	622,000	56,184,000	58,004,000
U. S. total	74,465,000	2,402,100	68,059,000	2,346,800	214,845,000	214,653,000
State—						
Arkansas	2,682,000	86,500	2,569,000	88,600	7,983,000	11,462,000
California	19,118,000	616,700	18,038,000	622,000	56,184,000	58,004,000
Colorado	259,000	8,400	229,000	7,900	707,000	697,000
Illinois	636,000	20,500	517,000	17,800	1,663,000	1,840,000
Indiana	78,000	2,500	82,000	2,800	237,000	201,000
Southwestern	71,000	2,300	74,000	2,600	215,000	168,000
Northeastern	7,000	200	8,000	200	22,000	33,000
Kansas	3,558,000	114,800	3,245,000	111,900	10,142,000	10,551,000
Kentucky	623,000	20,100	558,000	19,200	1,723,000	1,560,000
Louisiana	1,774,000	57,200	1,680,000	57,900	5,212,000	5,498,000
Gulf Coast	441,000	14,200	391,000	13,500	1,229,000	850,000
Rest of State	1,333,000	43,000	1,289,000	44,400	3,983,000	4,648,000
Michigan	29,000	900	30,000	1,000	90,000	96,000
Montana	352,000	11,300	354,000	12,200	1,076,000	1,265,000
New Mexico	76,000	2,500	66,000	2,300	221,000	408,000
New York	198,000	6,400	182,000	6,300	567,000	533,000
Ohio	615,000	19,800	563,000	19,400	1,738,000	1,857,000
Cent. & East.	477,000	15,300	439,000	15,100	1,359,000	1,424,000
Northwestern	138,000	4,500	124,000	4,300	379,000	433,000
Oklahoma	20,034,000	646,200	19,017,000	655,800	60,007,000	60,883,000
Osage County	.....	.....	1,879,000	64,000	.....	6,464,000
Rest of State	.....	.....	17,138,000	591,000	.....	54,419,000
Pennsylvania	834,000	26,900	770,000	26,600	2,366,000	2,298,000
Tennessee	5,000	200	4,000	100	11,000	12,000
Texas	21,237,000	685,100	18,164,000	626,300	58,378,000	50,787,000
Gulf Coast	3,202,000	103,300	2,846,000	98,100	9,277,000	12,442,000
Rest of State	18,035,000	581,800	15,318,000	528,200	49,101,000	38,345,000
West Virginia	504,000	16,300	460,000	15,900	1,420,000	1,478,000
Wyoming	1,853,000	59,800	1,531,000	52,800	5,107,000	5,223,000
Salt Creek	1,187,000	38,300	1,096,000	37,800	3,581,000	3,689,000
Rest of State	666,000	21,500	435,000	15,000	1,526,000	1,534,000
Classif cation by Gravity (approx.):						
Light crude	65,896,000	2,125,700	60,076,000	2,071,500	190,238,000	185,609,000
Heavy crude	8,569,000	276,400	7,983,000	275,300	24,607,000	29,044,000

STOCKS OF CRUDE PETROLEUM HELD IN THE UNITED STATES (BARRELS)

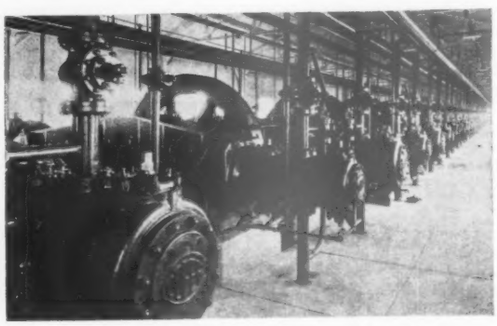
		March 31, 1928	February 29 1928*	March 31, 1927
AT REFINERIES (and in coastwise transit thereto). Reported by location of storage:				
East Coast:				
Domestic		8,553,000	8,086,000	7,230,000
Foreign		5,058,000	4,233,000	2,206,000
Appalachian		2,060,000	1,956,000	1,627,000
Indiana, Illinois, etc.		3,015,000	2,904,000	2,561,000
Oklahoma, Kansas, etc.		5,759,000	5,888,000	3,841,000
Texas:				
Inland		1,665,000	1,554,000	1,197,000
Gulf Coast:				
Domestic		7,868,000	7,996,000	8,481,000
Foreign		383,000	263,000	257,000
Arkansas and Inland Louisiana		654,000	578,000	441,000
Louisiana Gulf Coast:				
Domestic		5,859,000	6,063,000	7,317,000
Foreign		1,080,000	1,230,000	889,000
Rocky Mountain		1,655,000	1,610,000	1,385,000
Total east of California		43,609,000	42,361,000	37,433,000
ELSEWHERE THAN AT REFINERIES:				
Domestic—Reported by field of origin:				
Appalachian:				
N. Y., Pa., W. Va., Eastern and Central Ohio:	Gross	6,489,000	6,551,000	6,707,000
	Net	6,181,000	6,240,000	6,424,000
Kentucky	Gross	1,249,000	1,191,000	1,276,000
	Net	1,121,000	1,063,000	1,151,000
Lima-Indiana:	Gross	1,390,000	1,306,000	907,000
	Net	1,210,000	1,153,000	695,000
Illinois-S. W. Indiana:	Gross	12,711,000	12,534,000	12,295,000
	Net	12,208,000	12,039,000	11,810,000
Mid-Continent:				
Oklahoma; Kansas; Central, North, and West Texas	Gross	246,720,000	242,223,000	170,756,000
	Net	233,886,000	229,676,000	159,050,000
Northern Louisiana and Arkansas:	Gross	28,717,000	28,609,000	31,276,000
	Net	25,677,000	26,095,000	28,495,000
Gulf Coast:	Gross	17,153,000	17,873,000	18,248,000
	Net	16,779,000	17,478,000	17,896,000
Rocky Mountain:	Gross	27,346,000	27,202,000	26,886,000
	Net	27,304,000	27,158,000	26,835,000
Total pipe line and tank farm stocks east of California:	Gross	341,775,000	337,489,000	268,353,000
	Net	324,366,000	320,922,000	252,286,000
Foreign crude petroleum on Atlantic Coast		79,000	43,000	71,000
Foreign crude petroleum on Gulf Coast		45,000	14,000	341,000
		124,000	57,000	412,000
Total refinery, pipe line and tank farm stocks of domestic and foreign crude petroleum east of California		368,099,000	363,340,000	290,110,000
CLASSIFICATION BY GRAVITY (approx.):				
East of California:				
Light crude (24 degrees and above)		317,429,000	312,700,000	244,785,000
Heavy crude (below 24 degrees)		50,670,000	50,640,000	45,325,000
CALIFORNIA:				
Light		19,633,000	20,110,000	29,568,000
Heavy (including fuel)		94,484,000	94,797,000	189,796,000

*Revised. †Final figures.

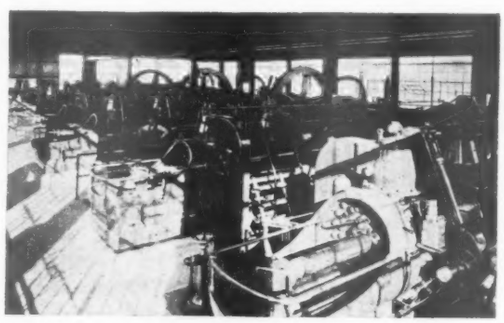
(Continued on Page 92)



EXPERIENCE

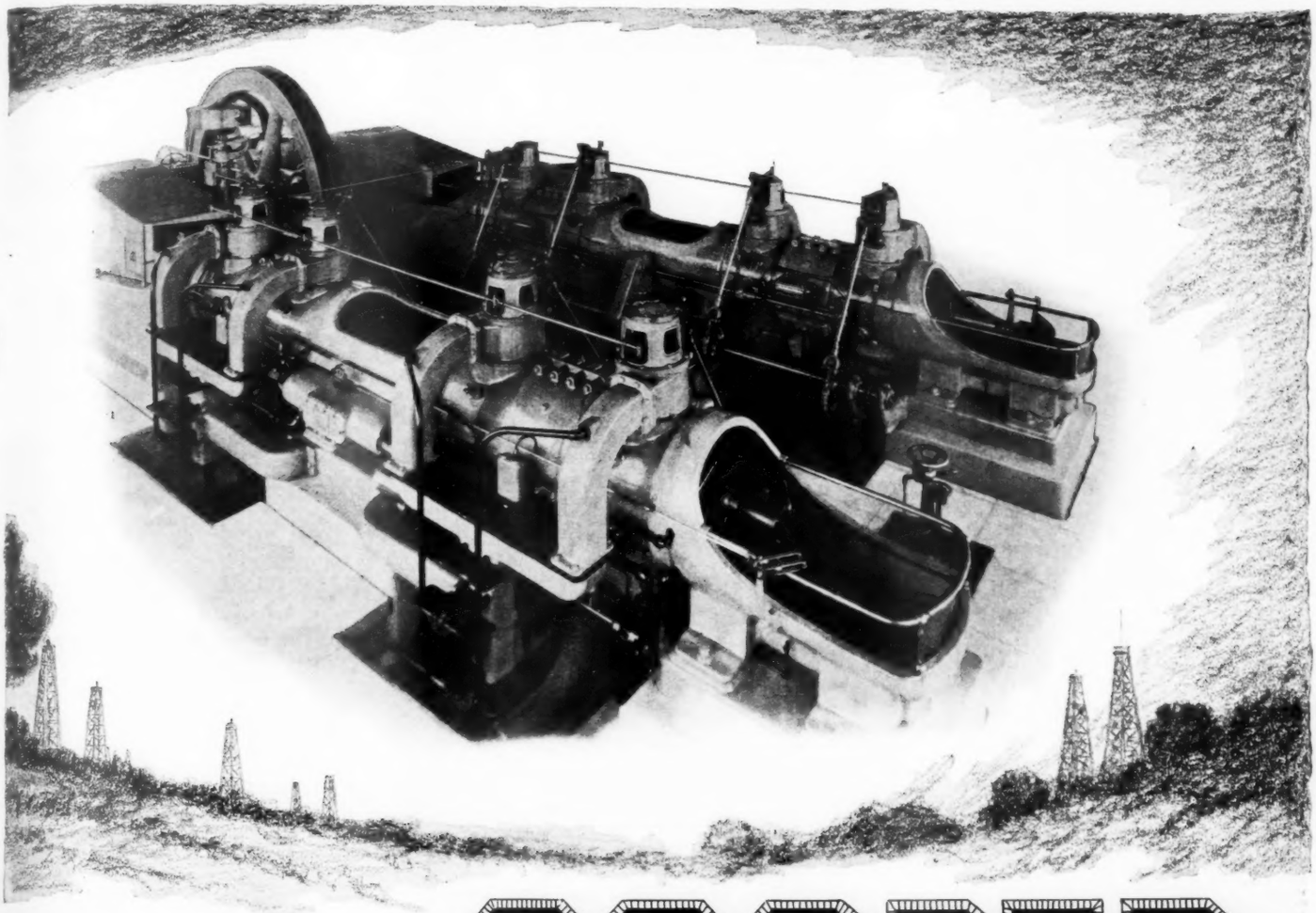


Lone Star Gas Company's Breckenridge, Texas, compressor station contains sixteen Cooper Type-80—170 B.H.P. four cycle gas engines driving Cooper gas compressors. The Lone Star Company installed the first single-acting gas engine ever built by the Cooper Company. In the years since they have installed a total of one hundred sixty-four of these Cooper compressors. Their experience with Cooper gas engines and compressors has been a guide post to dozens of other companies in selecting compressor equipment.



Four 1000 H. P. Cooper gas engines in Cities Service Gas Company's Ottawa, Kansas, station. This is one of the four stations built last year on the 450 mile pipe line from Amarillo, Texas, to Kansas City—the largest natural gas project ever completed. The order for nearly 16,000 H. P. of Cooper gas engines was the largest ever placed for this type of equipment.

Cities Service Companies have been using Cooper engines since 1913.



Points to COOPER

Men of sound reasoning, keen judgment and great responsibility have learned to listen when experience speaks—especially if it has to do with so technical and vitally important a problem as choosing gas engine driven compressors.

The very foundations of our natural gas development have rested on service. Nowhere in our modern civilization does an interruption in service mean so much as with our gas supply. Electric lights may go out while we sleep and again come on and no one be the worse but if the gas supply is cut off for even a few minutes, it can easily result in the loss of life.

The important links in any natural gas system are the compressor stations. The engines must not fail to maintain the necessary pressure at the different points in the system or the flame in our bathroom heaters or home heating systems will go out. Men bearing the responsibility of choosing such equipment seldom take chances. Usually they follow someone's else experience. This explains why nearly all the great natural gas systems use Cooper compressors and why nearly every page in the book of compressor station experiences tells a story of Cooper achievements.

The C. & G. Cooper Company

Tulsa, Dallas, Mt. Vernon, Ohio, Los Angeles

BUREAU OF MINES STATISTICS FOR MARCH, 1928

(Continued from Page 89)

IMPORTS AND EXPORTS OF CRUDE PETROLEUM (BARRELS)

(From Bureau of Foreign & Domestic Commerce)

	March, 1928 Total	March, 1928 Dly. Av.	February, 1928 Total	February, 1928 Dly. Av.	Jan.-Mar., 1928	Jan.-Mar., 1927
Imports	6,845,000	220,800	6,036,000	208,100	19,026,000	13,129,000
From Mexico	1,542,000	49,700	936,000	33,200	3,715,000	5,462,000
From Venezuela	3,885,000	125,300	3,574,000	123,200	10,742,000	4,549,000
From Colombia	1,199,000	38,700	1,499,000	51,700	3,339,000	2,280,000
From other countries	219,000	7,100	.....	.....	730,000	838,000
Exports*	1,530,000	49,400	1,243,000	42,900	3,999,000	3,568,000
Domestic crude oil:						
To Canada	1,298,000	41,900	998,000	34,400	3,161,000	2,895,000
To other countries	231,000	7,500	245,000	8,500	837,000	673,000
Foreign crude oil	1,000	.....	.....	.....	1,000	.....

*No shipments of crude to territories during March.

SHIPMENTS OF CALIFORNIA OIL THROUGH PANAMA CANAL TO EASTERN PORTS IN UNITED STATES

(Barrels)

	March, 1928	February 1928	Jan.-Mar., 1928	Jan.-Mar., 1927
Crude oil	423,000	415,000	1,072,000	1,792,000
Refined products	1,673,000	1,085,000	4,234,000	6,635,000
Gasoline	1,150,000	910,000	3,132,000	2,456,000
Asphalt	6,000	2,000	9,000	1,000
Gas oil	257,000	93,000	661,000	1,108,000
Fuel oil	196,000	79,000	277,000	2,997,000
Lubricants	69,000	1,000	155,000	73,000

COMPARATIVE ANALYSIS

(Thousands of barrels of 42 U. S. gallons)

	Production* Ttl.	Production* Dly. Av.	Imports† Ttl.	Imports† Dly. Av.	Exports† Ttl.	Exports† Dly. Av.	Stks. End Period	Dom. Demand Ttl.	Dom. Demand Dly. Av.
Crude run to stills:									
March, 1928	72,124	2,327	6,845	221	1,530	49	‡387,732	.....	....
February, 1928	65,601	2,262	6,036	208	1,243	43	‡383,450	.....	....
Jan.-Mar., 1928	205,918	2,263	19,026	209	4,005	44	‡387,732	.....	....
March, 1927	68,741	2,217	4,434	143	1,199	39	‡319,678	.....	....
Jan.-Mar., 1927	201,380	2,238	13,129	146	3,568	40	‡319,678	.....	....
Gasoline:									
March, 1928	29,245	943	259	8	4,016	130	40,229	24,041	776
February, 1928	26,775	923	372	13	3,341	115	38,782	21,136	729
Jan.-Mar., 1928	83,899	922	1,193	13	11,070	122	40,229	66,116	727
March, 1927	27,886	900	493	16	3,219	104	52,410	22,464	725
Jan.-Mar., 1927	80,870	899	1,429	16	10,320	115	52,410	58,592	651
Kerosene:									
March, 1928	4,717	152	6	...	1,852	60	7,826	2,737	88
February, 1928	4,783	165	11	...	1,551	54	7,692	3,221	111
Jan.-Mar., 1928	14,547	160	63	...	5,753	63	7,826	8,700	96
March, 1927	4,802	155	3	...	1,351	44	8,753	3,356	108
Jan.-Mar., 1927	14,368	160	4	...	4,366	49	8,753	9,828	109
Gas oil and fuel oil:									
March, 1928	34,071	1,099	848	27	3,969	128	§123,654	.....	....
February, 1928	30,944	1,067	666	23	3,420	118	§123,808	.....	....
Jan.-Mar., 1928	97,286	1,069	2,067	23	11,564	127	§123,654	.....	....
March, 1927	32,377	1,044	525	17	3,657	118	§112,357	.....	....
Jan.-Mar., 1927	95,498	1,061	2,238	25	11,201	124	§112,357	.....	....
Lubricants:									
March, 1928	2,905	94	....	...	837	27	8,412	1,988	64
February, 1928	2,728	94	....	...	841	29	8,332	1,533	53
Jan.-Mar., 1928	8,291	91	....	...	2,612	29	8,412	5,127	56
March, 1927	2,754	89	1	...	895	29	8,035	2,186	71
Jan.-Mar., 1927	7,669	85	3	...	2,379	26	8,035	4,833	54
Wax (thousands of pounds):									
March, 1928	50,207	1,620	1,767	57	40,147	1,295	136,465	41,606	1,342
February, 1928	49,068	1,692	1,337	46	38,036	1,312	166,241	15,025	518
Jan.-Mar., 1928	154,595	1,699	4,221	46	117,895	1,296	136,465	71,670	788
March, 1927	53,644	1,730	910	29	28,205	910	201,340	23,461	757
Jan.-Mar., 1927	156,121	1,724	3,418	38	81,056	901	201,340	61,474	683

*Figures in this column for crude petroleum are runs to stills. †From Bureau of Foreign and Domestic Commerce, subject to revision. Exports include shipments to Alaska, Hawaii and Porto Rico. ‡Includes California light crude. §Includes California heavy crude and fuel oil.

RUNS TO STILLS AND OUTPUT OF REFINERIES IN THE UNITED STATES, MARCH, 1928

	Crude Oil—Domestic	Crude Oil—Foreign	Unfinished oils	Natural gas gasoline	Total Input (bbls.)
East Coast	8,525,000	4,720,000	676,000	209,000	14,130,000
Appalachian	2,593,000	.....	103,000	49,000	2,745,000
Ind., Ill., etc.	7,710,000	.....	426,000	172,000	8,308,000
Okla., Kans., etc.	8,663,000	.....	364,000	398,000	9,425,000
Texas	14,840,000	56,000	839,000	495,000	16,230,000
Louisiana and Arkansas	5,286,000	392,000	213,000	428,000	6,319,000
Rocky Mountain	2,046,000	.....	582,000	133,000	2,761,000
California	17,293,000	.....	*297,000	†823,000	18,413,000
United States total	66,956,000	5,168,000	3,500,000	2,707,000	78,331,000
Daily average, 3/28	2,159,000	166,700	112,900	87,300	2,526,800
Daily average, 2/28	2,119,100	143,000	118,800	97,500	2,478,400
Texas Gulf Coast	11,291,000	56,000	819,000	418,000	12,584,000
Louisiana Gulf Coast	3,590,000	392,000	73,000	326,000	4,381,000

	Gasoline (bbls.)	Kerosene (bbls.)	Gas oil and fuel oil (bbls.)	Lubricants (bbls.)	Wax (lbs.)
East Coast	4,148,000	674,000	6,967,000	929,000	17,163,000
Appalachian	1,208,000	288,000	581,000	415,000	8,057,000
Ind., Ill., etc.	4,040,000	511,000	2,618,000	243,000	7,282,000
Okla., Kans., etc.	4,757,000	833,000	2,966,000	220,000	3,437,000
Texas	6,520,000	1,126,000	6,462,000	669,000	6,108,000
Louisiana and Arkansas	2,099,000	475,000	2,457,000	30,000	4,772,000
Rocky Mountain	1,299,000	154,000	632,000	60,000	3,388,000
California	5,174,000	656,000	11,388,000	239,000	.....
United States total	29,245,000	4,717,000	34,071,000	2,905,000	50,207,000
Daily average, 3/28	942,400	152,200	1,099,100	93,700	1,619,600
Daily average, 2/28	923,300	164,900	1,067,000	94,100	1,692,000
Texas Gulf Coast	5,180,000	881,000	4,806,000	640,000	5,801,000
Louisiana Gulf Coast	1,596,000	428,000	1,314,000	30,000	4,772,000

	Coke (tons)	Asphalt (tons)	Other finished products (bbls.)	Unfinished products (bbls.)	Losses (bbls.)
East Coast	12,100	131,300	76,000	27,000	465,000
Appalachian	3,200	.....	40,000	49,000	117,000
Ind., Ill., etc.	30,400	39,400	168,000	90,000	136,000
Okla., Kans., etc.	18,200	500	24,000	96,000	410,000
Texas	25,300	16,300	3,000	567,000	654,000
Louisiana and Arkansas	9,900	35,800	209,000	697,000	98,000
Rocky Mountain	8,100	200	9,000	510,000	32,000
California	.....	46,500	139,000	*211,000	346,000
United States total	107,200	270,000	661,000	2,247,000	2,258,000
Daily average, 3/28	3,460	8,710	21,300	72,500	72,800
Daily average, 2/28	3,450	7,190	21,900	75,900	67,900
Texas Gulf Coast	20,200	16,300	2,000	336,000	537,000
Louisiana Gulf Coast	9,600	34,300	190,000	541,000	31,000

Note: Wax, coke and asphalt equivalent to 280.5 pounds per barrel and 5.16 and 5.54 bbls. per ton, respectively.
*Includes 234,000 bbls. net tops rerun. †Includes 211,000 bbls. natural-gas gasoline run through pipe line.

INDICATED DELIVERIES OF CRUDE PETROLEUM, EXCLUSIVE OF CALIFORNIA GRADES, TO DOMESTIC CONSUMERS (BARRELS)

	March, 1928 Total	March, 1928 Dly. Av.	February, 1928* Total	February, 1928* Dly. Av.	Jan.-Mar., 1928	Jan.-Mar., 1927
Domestic petroleum by fields of origin:						
Appalachian	2,642,000	85,200	2,306,000	79,500	7,476,000	7,520,000
Lima-Indiana	88,000	2,800	107,000	3,700	325,000	437,000
Michigan	29,000	900	30,000	1,000	90,000	96,000
Ill., & S. W. Ind.	538,000	17,400	674,000	23,200	1,840,000	1,968,000
Mid-Continent	41,870,000	1,350,700	37,349,000	1,287,900	119,057,000	112,282,000
Gulf Coast	4,342,000	140,100	3,920,000	135,200	11,871,000	15,427,000
Rocky Mountain	2,394,000	77,200	2,310,000	79,700	7,042,000	8,833,000
Deliveries and exports	51,903,000	1,674,300	46,696,000	1,610,200	147,701,000	146,563,000
Deliveries	51,018,000	1,645,700	45,955,000	1,584,600	145,329,000	144,360,000
Foreign petroleum	6,777,000	218,600	6,107,000	210,600	18,990,000	13,326,000
Deliveries of domestic and foreign petroleum	57,795,000	1,864,300	52,062,000	1,795,200	164,319,000	157,686,000

*Revised.

NUMBER OF PRODUCING OIL WELLS COMPLETED*

March, 1928	February, 1928	Jan.-Mar., 1928	Jan.-Mar., 1927
949	836	2,549	4,144

*For States east of California, from The Oil and Gas Journal; for California, from the American Petroleum Institute.

GASOLINE PRODUCTION BY THE VARIOUS METHODS—MARCH, 1928

(Barrels)

	Straight run	Pct.	Cracked	Pct.	Natural-gas Gasoline	Pct.	Total
East Coast	2,361,000	57	1,578,000	38	209,000	5	4,148,000
Appalachian	821,000	68	383,000	28	49,000	4	1,208,000
Indiana, Illinois, etc.	2,284,000	57	1,584,000	39	172,000	4	4,040,000
Oklahoma, Kansas, etc.	2,834,000	60	1,525,000	32	398,000	8	4,757,000
Texas	3,250,000	50	2,775,000	42	495,000	8	6,520,000
Louisiana and Ark.	1,024,000	49	647,000	31	428,000	20	2,099,000
Rocky Mountain	648,000	50	518,000	40	133,000	10	1,299,000
California	3,701,000	71	650,000	13	*823,000	16	5,174,000
Total	16,923,000	58	9,616,000	33	2,707,000	9	29,245,000
Total Feb., 1928	16,257,000	57	8,691,000	32	2,827,000	11	26,775,000
Total Jan.-Mar., 1928	48,223,000	58	27,202,000	32	8,474,000	10	83,899,000
Gulf Coasts	3,081,000	45	2,951,000	44	744,000	11	6,776,000

*Includes natural-gas gasoline run through pipe lines.

STOCKS HELD BY THE REFINING COMPANIES IN UNITED STATES, MARCH 31, 1928

	Gasoline (bbls.)	Kerosene (bbls.)	Gas oil and fuel oil (bbls.)	Lubricants (bbls.)
East Coast	7,101,000	1,592,000	9,414,000	3,043,000
Appalachian	1,352,000	286,000	929,000	1,066,000
Indiana, Illinois, etc.	5,617,000	876,000	1,222,000	914,000
Oklahoma, Kansas, etc.	4,060,000	525,000	4,448,000	565,000
Texas	5,648,000	1,493,000	7,809,000	1,743,000
Louisiana and Arkansas	1,725,000	1,112,000	4,567,000	119,000
Rocky Mountain	2,114,000	314,000	781,000	139,000
California	12,612,000	1,629,000	.....	823,000
Total U. S.	40,229,000	7,826,000	*29,170,000	8,412,000
Total U. S., February 29, 1928	38,782,000	7,692,000	*29,011,000	8,332,000
Texas Gulf Coast	4,742,000	1,399,000	6,255,000	1,675,000
Louisiana Gulf Coast	1,617,000	1,099,000	3,955,000	119,000

	Wax (lbs.)	Coke (tons)	Asphalt (tons)	Other finished products (bbls.)	Unfinished oils (bbls.)
East Coast	45,177,000	33,000	123,800	133,000	7,041,000
Appalachian	19,794,000	2,700	.....	72,000	1,164,000
Indiana, Illinois, etc.	18,527,000	42,100	34,600	778,000	3,587,000
Oklahoma, Kansas, etc.	2,222,000	58,200	1,700	131,000	2,247,000
Texas	7,387,000	94,100	8,700	14,000	9,805,000
Louisiana and Arkansas	30,850,000	63,700	34,300	91,000	1,823,000
Rocky Mountain	12,492,000	58,600	9,100	22,000	1,447,000
California	16,000	.....	56,500	285,000	†8,431,000
Total U. S.	136,465,000	352,400	268,700	1,527,000	35,545,000
Total U. S., February 29, 1928	166,244,000	337,000	230,300	1,297,000	35,972,000
Texas Gulf Coast	7,292,000	79,400	8,600	8,000	8,340,000
Louisiana Gulf Coast	30,850,000	61,700	34,000	86,000	1,308,000

*East of California. †Includes 1,361,000 bbls. tops in storage.

NATURAL-GAS GASOLINE, MARCH, 1928

The production of natural-gas gasoline registered a material slump in March, when the total output amounted to 143,900,000 gallons. This represents a daily average of 4,640,000 gallons, a decrease from February of 110,000 gallons. The major portion of the decreased daily average output was reported in the Appalachian district and in the Seminole Field, the leading producing area in the Oklahoma-Kansas district, where the production of casinghead gas is on the decline.

Stocks of natural-gas gasoline at the plants again increased and amounted to 35,358,000 gallons on March 31 as compared with 34,600,000 gallons on hand the previous month. Blending at the plants showed a small increase but blending at refineries dropped off.

(Thousands of gallons)

	Natural-gas gasoline: Production Mar., 1928	Feb., 1928	Jan.-Mar., 1928	Mar., 1927	Stocks end of month Mar., 1928	Feb., 1928	Blended motor fuel: Natural gasoline used	Naphtha or other oils used	Stocks end of month
Appalachian	10,100	10,300	31,000	9,600	4,788	3,828	136	154	254
Ind., Ill., etc.	1,400	1,300	4,000	1,500	428	428	59	1	25
Okla., Kans., etc.	52,700	51,600	155,700	45,600	16,738	17,510	1,795	2,741	560
Texas	27,000	25,500	78,800	28,400	9,832	9,006	286	593	136
La. and Ark.	7,200	6,800	20,700	7,000	1,700	1,945	342	561	82
Rocky Mountain	3,800	3,400	10,400	4,000	479	490	....	....	84
California	41,700	38,700	122,400	41,300	1,393	1,393	(*)	(*)	(*)
Total United States	143,900	137,700	423,000	137,400	35,358	34,600	2,619	3,849	1,142
Daily average	4,640	4,750	4,650	4,432	....	....	....	....	....

*Not available.

The indicated output of motor fuel from the above and other sources may be expressed by the following table.

(Thousands of gallons)

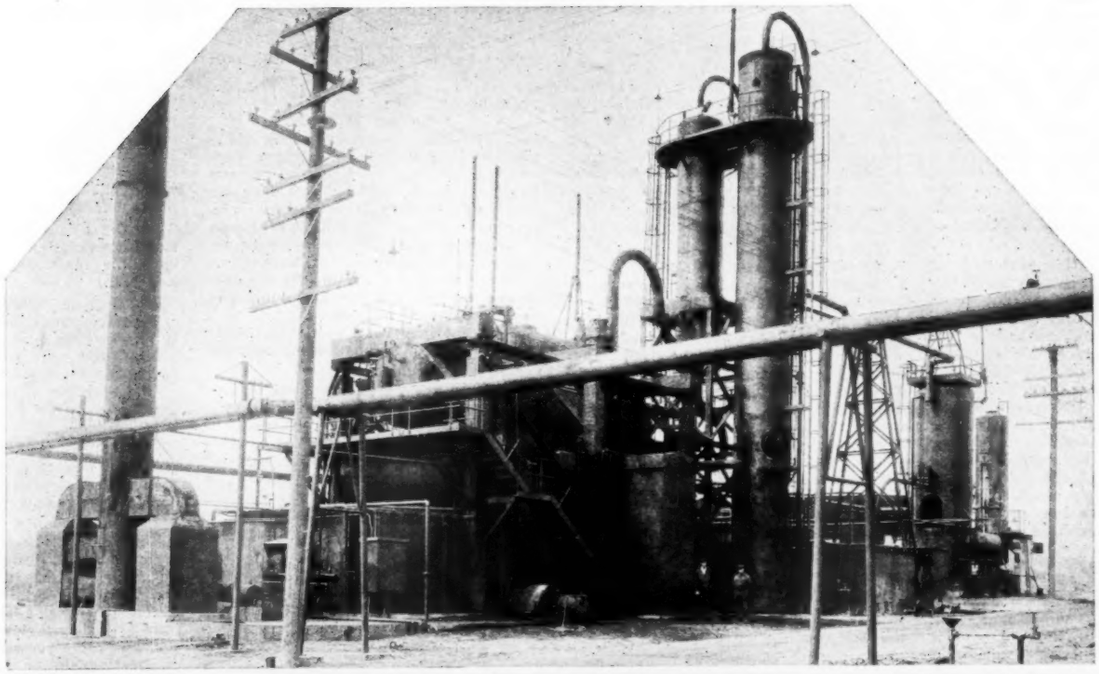
	March, 1928	February, 1928	Jan.-Mar., 1928	March, 1927
Gasoline produced at refineries *†	1,228,300	1,124,500	3,523,800	1,171,200
Raw gasoline blended at plants east of California	2,600	2,500	7,400	2,500
Raw gasoline sold direct to jobbers	2,100	2,100	6,300	800
Benzol production ‡	10,000	9,100	28,600	9,500
Total motor fuel produced	1,243,000	1,138,300	3,566,100	1,184,000
Daily average	40,097	39,250	39,188	38,190
*Includes natural gasoline blended at refineries	104,800	110,300	329,700	98,800
†Includes natural gasoline run through refinery pipe lines in California	8,900	8,500	25,900	14,300

‡Estimated with production of by-product coke as a basis.

JENKINS CRACKING PROCESS

PRODUCES QUALITY GASOLINE

This is the Jenkins Unit which is producing such amazing results in cracking California residuum.



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Limiting Factors in Gas Projects

Speaker at Natural Gas Convention Sees Danger in Promotion Enterprises Without Full Consideration of Conditions

By P. McDonald Biddison*
Gas Production Co. of Louisiana

The past four years have witnessed an unusual activity in the natural gas industry, unusual not only in the number of lines completed and projected but in their sizes and lengths and in the consolidation of systems representing large amounts of capital. Concurrent with this development work and consolidation of operating properties, we have seen attempts to promote projects on such grand scales as to startle the imagination. We have seen also pipe lines of large capacity, both projected and laid into markets apparently already amply supplied with natural gas, as well as into new markets, having back of them gas reserves which on careful analysis are apparently sufficient for but a brief portion of the period required to amortize the pipe line investment. Yet there seems to have been little, if any, difficulty experienced in financing the projects. We have seen promoters who had no gas, no contracts for gas, no money and no financial connections, and no knowledge of the gas business glibly quote rates and secure franchises in communities hundreds of miles from any gas field at rates which we have been accustomed in the past to associate with communities adjacent to natural gas production, in competition with gas producers having both the requisite finances and knowledge and experience in the business, thus creating an expectancy of rates in the public mind that could never be realized and in some cases preventing the materialization of natural gas service to many communities that could have been served had it not been for the activities of a procession of promoters with nothing at stake, who withdrew from the picture when competent analysis showed the absurdity of their proposals.

What has brought this avalanche of promotion upon us? Probably many factors contribute to it. I do not recall any failure of a natural gas company in recent years. We have had periods of partial shortage in supply in many regions but the failing supply had in all cases of which I know been fortunately augmented by newly discovered producing areas within reach of the systems. This good fortune has eliminated in the minds of the investing public the old fear of the hazards of the industry and money for new projects has been available at rates nearly as low as for utilities and industries without or nearly without hazard, whose property could be maintained almost in perpetuity, and has enabled financing in some instances on a security retirement period far in excess of the life of the gas supplies in sight. By virtue of the long lives of present companies and of reduction in operating costs through consolidations and amalgamations earnings have in general been on so favorable a basis that the public has been eager for natuural gas securities and promoters have utilized this eagerness to the fullest advantage in some instances with little regard as to what the project might ultimately do for the investor.

Effect on Legitimate Projects

Can it be said, however, that because for 10 or 15 years there have been no fatalities among natural gas companies that the hazard which we used to recognize no longer exists? Is one assured of eternal life merely by contemplation of the fact that he yet lives? Are the low interest and amortization rates now current in such financing justifiable because for the past 15 years the natuural gas companies have been lucky and are we justified in forgetting Kansas, norwestern Ohio, and Indiana? What will the effect upon legitimate projects, with ample reserves, of the failure of some of the recent propositions? The legitimate and safe projects will bear the onus of the failures with the result of abnormally high interest rates for natural gas projects and greatly increased costs of service to the ultimate consumer. There are some definite limits of possibilities in these projects and it is the purpose of this paper to call attention to some of those possibilities.

The first place where the promoters seem to go astray is in the estimation of the probable gas sales. They usually assume that all other fuel can be replaced by natural gas. For domestic consumption they assume figures of use borrowed from northern cities and try to apply them indiscriminately with little if any regard to climatic conditions or the effect of retail domestic prices upon the extent of its use. For industrial service little if any consideration is given to the effect of the manner of use of the present fuel upon the rates obtainable for natural gas in competition with it. For domestic use in southern and southwestern communities experience shows that sales of about 24,000 to 27,000 cubic feet per year may be realized for cooking and water heating, practically replacing the ordinary uses of manufactured gas on a 70 per cent basis. This business can be had almost independently of rates and its volume is almost but not quite independent of climate. The domestic heating load is however dependent upon both the climate and the rates for the commodity. At rates but slightly above the cost of competitive fuels nearly the whole of the domestic house heating is obtainable and its volume then becomes a function of the climate. It can be closely estimated under such conditions at 16 cubic feet per customer per degree day deficiency below 65 degrees Fahrenheit and data on the degree day deficiency is obtainable from Climatological Reports of United States Weather Bureau. The peak load of such business may amount to over 40 feet per meter per hour. For any minimum daily temperature the peak space heating load per day will amount to 16 feet per meter per degree deficiency below 65 degrees. Thus for a 25 degree day a peak of 480 feet per day may

(Continued on Page 159)

*Before Natural Gas Department, A.G.A., Dallas, Tex.

Sale of Gas to Industrial Plants

Use of Calorific Values as a Basis of Calculations for the Determination of Comparative Fuel Costs

By F. Y. Hutchinson*
Chief Engineer, Houston Pipe Line Co.

In the sale of gas to large industrials the leading factor to be considered is fuel economy and, as there is such a prevailing tendency to use merely the calorific values as a basis of calculations for the determination of comparative fuel costs, I am taking the liberty of dwelling largely on this subject and confining this comparison to natural gas and fuel oil.

The industries of South Texas are large refineries burning from 10,000,000 to 20,000,000 feet per day; sulphur mines burning 20,000,000 to 30,000,000 feet per day; electric generating plants burning 10,000,000 to 15,000,000 feet; sugar refineries, cement plants, chemical plants and cotton oil mills burning in the neighborhood of 5,000,000 feet per day each. These industries on account of their location in an oil-producing and refining area, were burning fuel oil until the advent of natural gas and are now, without exception, burning gas. This fact has made possible a real comparison of fuel values under actual operating conditions over a period of years, using each type of fuel, under the same operating conditions, and the industries have been kind enough to co-operate in every way to furnish us with complete information along these lines. Due to the nature of the data compiled in the different plants, the names of concerns furnishing such will not be divulged, nor, can we give results determined from any individual plant as a competitor might link these results with the actual plant in which they were obtained; even though names were withheld. However, we have taken an average of all our findings in these industrials and present them, as follows:

Boiler h.p. per bbl. of oil	133
Pounds of fuel per boiler h.p.	2 5
Boiler h.p. per 1,000 cu. ft. gas	24 6
Boiler h.p. per 1,000,000 B.t.u. oil	21 3
Boiler h.p. per 1,000,000 B.t.u. gas	24 5
Efficiency, gas	81%
Efficiency, oil	74%
Boiler rating, 10 to 20% higher on gas than on oil.	
Equivalent gas to bbl. of oil, cu. ft.	5,385
Equivalent gas bbls. were noted as low as, cu. ft.	4,390
The B.t.u. value of the gas burned has averaged 1,005 on a day basis.	

It is interesting to note that efficiencies of 80 per cent or better have been realized continually by most all these industrials while burning natural gas and an average of 74 per cent has been realized while burning oil.

Efficiency of Fuels

J. M. Robertson, who has collaborated with me in this study, and I have made an effort to determine the efficiency possible in burning various fuels by calculation, taking the ultimate analysis of the fuel in question as a basis of computations and calculating losses in burning, stack losses, etc., but have found that for many reasons results obtained in this manner are not at all reliable. The reasons are, as follows:

1. Authorities vary widely in their calorific values for hydrogen, methane and ethane.

2. With the present methods of ultimate analysis, there is a variation of 2 per cent plus or minus in determination.

3. Correct assumptions as to excess air, radiation losses and initial temperature of combustion products cannot be made, but depend entirely upon each individual setting.

4. If calorific value is determined by analysis no corrections can be made for the heat absorbed in endothermic reactions as the fuel oil proceeds to combustion.

5. Even if the results of a comparison of this kind were reliable, they would not represent actual operating conditions unless in the case of oil, assumptions were made covering the loss in efficiency due to soot and slag accumulation.

6. Correct assumptions for efficiency loss due to soot and slag accumulations cannot be made.

Operating Comparisons

Due to the foregoing reasons, we believe that the only accurate method of comparison is by actual plant operation. Having found the equivalent gas to a barrel of oil in this manner, we find that the following items seriously affect the economic value of fuels and should be carefully analyzed in every plant where the study of fuel economy is under consideration.

1. Operating labor is more with oil than with gas.

2. Boiler tube replacements on gas are about one-fifth of those on oil.

3. Boiler furnace repairs on gas are about one-third of those on oil.

4. Interest, taxes, depreciation and insurance costs on stored oil.

5. Transportation cost of oil to plant site.

6. Pumping cost of oil to burners.

7. Atomization steam or electricity for oil burners.

8. Operation and upkeep of soot blowers in burning oil.

9. Oil is paid for in advance while the monthly gas bill does not have to be paid until the tenth day of the succeeding month.

10. Purchasing cost.

11. Economical boiler rating is greater on gas than on oil.

12. Production losses due to shutdowns for repairs while burning oil.

13. Stability of fuel cost on gas and unstable price for fuel oil.

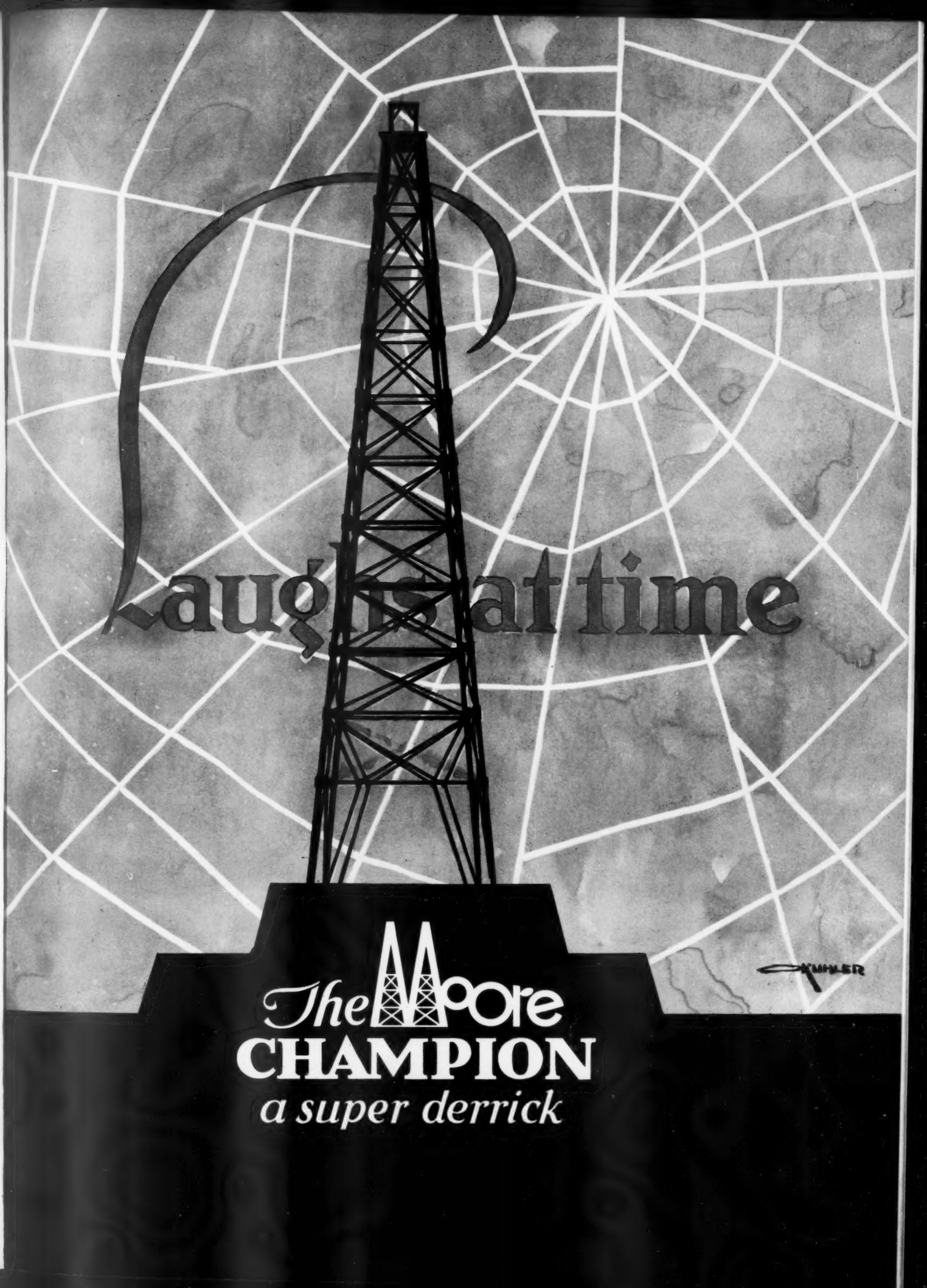
14. In process work lower temperatures can be maintained more readily and efficiently on gas than on oil.

15. Sudden peak loads can be taken care of more easily with gas.

In several plants we have made careful analyses along these lines and find although the equivalent gas barrel varies but little, that the final analysis due to the above items varies a great deal in different plants, but in all plants they have a very important bearing on actual fuel cost comparisons. These items, some at least, might be considered negligible upon first thought but when carefully analyzed in terms of dollars and cents, (which can be done easily), and carried out to several decimal places, their real significance will be realized. For those who have not had occasion to make calculations along these lines and wish to do so, we can suggest the following method:

Each item is expressed as a burning cost per barrel and per 1,000,000 feet of gas, based on actual price at that certain point, and on the amount of fuel used per day as averaged over a year's time. A summation of these costs while on gas and while on oil will give a correct comparison of the actual cost of burning the two fuels. Having found this, a direct comparison is easily obtainable. We have found in the plants where these calculations have been carried out, the relation of natural gas at 20 cents per 1,000 cubic feet ranges from 90 cents down to 50 cents a barrel of fuel oil as an actual equivalent.

*Before Natural Gas Department, A.G.A., Dallas, Tex.


Laughs at time
The Moore
CHAMPION
a super derrick

The Moore CHAMPION
a super derrick

Conquers the Giants in the Oil Country

THE relentless Giant of Time has many weapons at his command. In the oil country, he fills the years with an endless succession of attacks. Only the fit survive. A derrick, to be long lived, must have all-around excellence. The Moore Champion Derrick stands the test of time.

The derrick top has received the attention of the designers fully in keeping with its importance. Every part has been made to perform in full measure the service which it is called upon to render. Inside bracing on the gin pole adds strength and gives it a very desirable rigidity. The crown safety platform is trim and strong, affording adequate working space free from obstructions.

The heavy top castings receive through bolts for the attachment of the top leg sections. They present a face to meet reinforcing legs flush, and so insure a solid bearing. The water table, of heavy steel I beams, with its rigid corner plates, reinforces the top of the derrick at a critical point, for it is here the heavy load from the crown block is imposed upon the structure.

The clamps and the bracing play an important part at the top and throughout the derrick. Brace intersection attachments effectively keep the braces in line and prevent rattling. The method of attaching the ladder, so that the climber's foot does not strike the derrick girts, is an especially important safety feature.

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Stocks in All Principal Fields

WILDCAT OPERATIONS IN OKLAHOMA

(Continued from Page 50)

Marland Oil Co.'s No. 1 Kidd, NW cor. SW Sec. 32-29-1W ..... Running casing 4,084 ft.

KINGFISHER COUNTY

Slick & Harrington's No. 1 Cromer, SE cor. NE NE Sec. 25-19-5W ..... Location.
H. H. Morgan's No. 1 Buscon, SW cor. SE NE Sec. 30-16-9W ..... Shut down 1,610 ft.
Galt-Brown Oil Co.'s No. 1 Wolff, NW SE Sec. 6-16-7W.. Drilling 3,897 ft.
McKinney & Crawford's No. 1 Sturgeon, NE cor. SW Sec. 27-16-6W ..... Shut down 4,509 ft.
Wiley & Manahan's No. 1 Johnson, C NW Sec. 26-16-5W.. Shut down 4,512 ft.

LOGAN COUNTY

Champlin Refining Co.'s No. 1 Clark, SE cor. SW Sec. 8-19-4W ..... Rigging up rotary to drill deeper, 5,825 ft.
Sinclair Oil & Gas Co.'s No. 1 Webber, SE cor. SE Sec. 18-19-4W ..... Drilling past pipe 4,500 ft., total depth 4,808 ft.
Haley & Smith's No. 1 Guier, SE cor. SW Sec. 33-18-3W... Underreaming casing 3,825 ft.
Garber & Fulse's No. 1 Widdoes, NE cor. SE NW Sec. 33-18-2W ..... Shut down 1,200 ft.
T. B. Slick's No. 1 Bryan, SW cor. SE Sec. 28-17-1 ..... Plugging back to sand 5,630 ft.; having casing trouble.
Willis and others' No. 1 Sweezy, SW cor. NW SE Sec. 20-17-3 ..... Shut down 4,677 ft.
W. R. Ramsey's No. 1 McMillan, NW SW Sec. 24-19-2W... Hole full of water at 4,507-17 ft.; shut down for orders.
Su-Vi-Bar's No. 1 Kirkpatrick, NE SW SW Sec. 12-15-1W. Casing trouble 4,995 ft.

BLAINE COUNTY

Lowen and others' No. 1 Unknown, NW cor. SW NW Sec. 27-16-11W ..... Spudded and shut down.

MUSKOGEE COUNTY

Finefield and others' No. 1 Jobe, NE cor. NW SE Sec. 12-15-18 ..... Drilling 1,750 ft.
Elk Drilling Co.'s No. 1 Jones, SW cor. SW Sec. 34-13-17 ..... Spudded and shut down.
L. T. Haney's No. 1 Mitchell, SE cor. NW SE Sec. 33-13-18 ..... Shut down for casing 1,766 ft.
J. L. Slusher's No. 1 Johnson, NE cor. SW NW Sec. 29-15-20 ..... Machine.
C. D. Bradley's No. 1 Butler, NW cor. SE Sec. 14-15-19.. Shut down 700 ft.

HUGHES COUNTY

W. J. Monahaim's No. 1 Pusby, C NW NE Sec. 14-4-9 .... Location.
Noble Oil & Gas Co.'s No. 1 Wickett, SE cor. SE Sec. 26-6-9 ..... Sand 1,935-50 dry and drilling deeper.

OKLAHOMA COUNTY

Cromwell Oil & Gas Co.'s No. 1 Proctor, C SE Sec. 21-14-2W ..... Shut down 4,075 ft.
Slick & Bailey's No. 1 Koester, C SE NE Sec. 15-13-3W .. Running casing 3,970 ft.
Cromwell & Franklin's No. 1 Thompson, SW cor. NE NE Sec. 15-12-3W ..... Fishing 4-inch liner, 6,840 ft.
Cromwell & Franklin's No. 1 Gross, SW cor. NE SW Sec. 22-10-2W ..... Shut down 4,702 ft.

CREEK COUNTY

J. J. Schock's No. 1 Harjo, NW cor. NE NE Sec. 26-14-10 ..... Location.

CANADIAN COUNTY

T. B. Slick and others' No. 1 Pazowrech, NW SE Sec. 29-13-5W ..... Hole full of water 4,338-4,482 ft.. shut down 4,580 ft.
Ramsey Brothers' No. 1 Newman, CSL NE Sec. 9-11-7W.. Moving in rotary 4,675 ft.

LINCOLN COUNTY

Su-Vi-Bar Petroleum Co.'s No. 1 School Land, C NE SE Sec. 16-13-4 ..... Shut down 4,500 ft.

OKFUSKEE COUNTY

Moose & Daniels' No. 1 Stidham, SW cor. NW Sec. 4-11-10 ..... Shut down 622 ft.

SEQUOYAH COUNTY

Citizens Gas Co.'s No. 1 Johnson, NE SW NE Sec. 33-12-7 ..... Sand 1,215-25 ft.; 1,500,000 ft. gas; shut in.
Hunt and others' No. 1 Unknown, SE cor. NW SW Sec. 12-12-23 ..... Spudded and shut down.
Western Natural Gas Co.'s No. 1 Green, SW cor. SE Sec. 17-11-17 ..... Drilling 310 ft.

POTTAWATOMIE COUNTY

Shaffer-Kilgore-Sykes' No. 1 Ives, C SE SE Sec. 12-10-3 ..... Shut down 5,327 ft.
Superior Oil Co.'s No. 1 Herminghausen, SW cor. NW NE Sec. 24-8-2 ..... Fighting cave 4,387 ft.
Davy & Detrick's No. 1 McGehee, SW SE NW Sec. 10-6-2 ..... Fishing 4,998 ft.
Amerada Pet. Corp.'s No. 1 Gravel, SW SE NE Sec. 1-8-4 ..... Plugged back 4,429, show of oil; water shut off, will shoot.
Indian Terr. Ill. Oil Co.'s No. 1 White, NE cor. NE SW Sec. 21-7-5 ..... Drilling 3,865 ft.
Roxana Pet. Corp.'s No. 1 Johnson, NE cor. SE NE Sec. 20-6-5 ..... Location.
T. B. Slick & Roxana Pet. Corp.'s No. 1 Hurst, SE cor. NW NW Sec. 17-7-2 ..... Moving in tools.
T. B. Slick's No. 1 School Land, SE cor. SE Sec. 16-6-5... Drilling 3,515 ft.

CADDO COUNTY

Magnolia Petroleum Co.'s No. 1 Shelby, SW cor. SW Sec. 28-10-12W ..... Drilling 2,718 ft.
J. V. Bailey's No. 1 Hubbard, C NE NW Sec. 1-10-6W.. Shut down 160 ft.
W. J. Hartley's No. 1 Galbreath, SE cor. NW SE Sec. 29-5-12W ..... Shut down 3,394 ft.
English Drilling Co.'s No. 2 Pruitt, CNL NW SE Sec. 23-6-10W ..... Rigged up and shut down.

OSAGE COUNTY

Devonian Oil Co.'s No. 1, NW cor. SE Sec. 18-22-8 ..... Shut down 3,115 ft.

SEMINOLE COUNTY

Prairie Oil & Gas Co.'s No. 1 Davis, NE SE Sec. 21-10-7.. Rig.
Prairie Oil & Gas Co.'s No. 1 Varnum, NW cor. SW SW Sec. 5-9-6 ..... Swabbing 126 bbls. from Hunton lime; total depth 4,239 ft.
The Texas Company's No. 1 Reed, SW cor. SW Sec. 12-8-5 ..... Wilcox sand 4,720 ft.; hole full of water; dry and abandoned; running tubing to pump.
Simon & Bean's No. 1 Palmer, SE cor. NW NE Sec. 7-7-6 ..... Rigged up and shut down.
Barnsdall Oil Co.'s No. 1 Guinn, SW cor. SW Sec. 16-7-5.. Drilling 2,965 ft.
Reiter-Foster Oil Co.'s No. 1 Coat, SW cor. NW SW Sec. 14-7-6 ..... Wilcox sand 4,256-58 ft.; 2,780 bbls. daily.
Magnolia Petroleum Co.'s No. 1 Vierson, SE SE NW Sec. 5-6-7 ..... Wilcox 4,530-35 ft.; hole full of water, dry and abandoned.
Fuhrman Petroleum Co. and Superior Oil Co.'s No. 1 Davis, SW SW SE Sec. 3-10-6 ..... Location.
C. W. Whitney's No. 1 Harjo, NE cor. NW NE Sec. 25-7-6 ..... Drilling 480 ft.
Blackwell Oil & Gas Co.'s No. 1 Mitchell, SE cor. NE SW Sec. 6-10-7 ..... Drilling 3,270 ft.
C. W. Whitney's No. 1 Harjo, NE cor. NW NE Sec. 25-7-6 ..... Drilling 3,485 ft.
Shaffer Oil & Ref. Co.'s No. 1 Catchochee, SW cor. SW NE Sec. 18-10-7 ..... Drilling 580 ft.
Sands Pe. Co. and others' No. 1 Harrison, SW cor. SW SE Sec. 4-7-7 ..... Spudded.
Tidal Oil Co.'s No. 1 Foster, SW cor. SE SE Sec. 7-7-7... Drilling 1,970 ft.

DEWEY COUNTY

Huckaby & McCoy's No. 1 Perfect, NE cor. NE Sec. 9-18-15W ..... Shut down 3,370 ft.

BECKHAM COUNTY

C. & H. Petroleum Co.'s No. 1 Barnes, SW cor. NW NE Sec. 32-9-22W ..... Shut down 3,800 ft.

ATOKA COUNTY

G. S. Cochran's No. 1 Hampton, NW cor. NW Sec. 21-1-14 ..... Rig.
Pferffel and others' No. 1-A Carter, NE cor. NE Sec. 35-3-22W ..... Shut down 300 ft.

GRADY COUNTY

Clark & Cowden's No. 1 Freed, NE cor. SW SW Sec. 33-5-7W ..... Rig.
Remington and others' No. 1 Fryrear, SW SW NE Sec. 13-9-5W ..... Shut down 720 ft.; may start soon.
Bedner and others' No. 1 Willis, C SW NW Sec. 13-7-5W ..... Shut down 2,450 ft.
Nichlos & Page's No. 1 Drake, SE NE SE Sec. 7-6-7W... Shut down 2,307 ft.
Wirt Franklin Petroleum Co.'s No. 1 Garden, SE cor. SW NE Sec. 1-4-7W ..... Sand 2,003-12 ft.; 1,000,000 ft. gas.
Commercial Development Co.'s No. 1 Chrisman, C NE NE Sec. 21-4-7W ..... Drilling 1,702 ft.
Magnolia Petroleum Co.'s No. 1 Pursley, SE SW NW Sec. 8-4-6W ..... Dry and abandoned 3,905 ft.
Simpson & Fell's No. 1 Long, SW cor. SE SE Sec. 36-5-7W ..... Rig.
Galt Brown Oil Co.'s No. 1 Burrey, C NW NE Sec. 14-4-9. Drilling 2,435 ft.

MINTOSH COUNTY

Marione Oil Co.'s No. 1 Sanders, NW cor. NE SW Sec. 10-9-18 ..... Shut down 2,250 ft.

CLEVELAND COUNTY

Daniels & LeWright's No. 1 Vandever, C SW Sec. 15-7-1w ..... Sand 2,784-2,768 ft., dry; shut down 2,975 ft.

KIOWA COUNTY

Blue Mountain Oil Co.'s No. 1 Jones, SE cor. NW NW Sec. 17-5-14w ..... Shut down 530 ft.
Johnson & McDowell's No. 1 Thompson, SW cor. NE Sec. 6-6-15w ..... Drilling 770 ft.
Dave Malernec's No. 1 Van Kirk, NW cor. NW Sec. 35-7-15w ..... Casing 490 ft.
A. C. Varner and others' No. 1 Bonham, CSL NW NW Sec. 5-6-18w ..... Shut down 1,127 ft.

PONTOTOC COUNTY

Gillespie & Gant's No. 1 Taylor, SW SW SE Sec. 13-5-4.. Sand 2,818-52 ft., water; plugged back 2,570 ft., shot 80 and 20 quarts; swabbed 29 bbls.; shut down.
T. B. Slick's No. 1 Barnett, NE SE NW, Sec. 13-5-6..... Bad hole 3,976 ft.
Mid-Continent Petroleum Corp.'s No. 1 Harjo, SE NE NE Sec. 14-5-7 ..... Sand 2,618-22 ft.; 10,000,000 ft. of gas.
T. B. Whitney and others' No. 1 Moore, SW cor. SE Sec. 17-5-9 ..... Shut down 2,654 ft.
Winkler and others' No. 1 Timer, C SW SE Sec. 31-5-9... Shut down 2,761 ft.
R. F. Garland's No. 1 Strickland, SW NW SW Sec. 10-4-3 ..... Shut down 2,650 ft.
C. J. Shervin and others' No. 1 Wright, NW NE NE Sec. 13-4-6 ..... Underreaming casing 2,020 ft.
Boles and others' No. 1 Rayburn, SW SE Sec. 35-4-6..... Shut down 1,340 ft.
Texas-Pacific Coal & Oil Co.'s No. 1 Stewart, C SW NE Sec. 11-5-5 ..... Repairing rig 2,314 ft.
Henry and others' No. 1 Gregg, SW SE NW Sec. 14-4-7.. Shut down 1,090 ft.

GARVIN COUNTY

Dixie Oil Co.'s No. 1 Perkins, SE NW Sec. 18-4-1 ..... Drilling 5,385 ft.
Magnolia Petroleum Co.'s No. 1 Vaughn, NW SW NW Sec. 12-3-1 ..... Drilling 5,525 ft.
Heath & Bauman's No. 1 Hattell, SW SE SW Sec. 10-3-3 ..... Shut down 1,640 ft.

COMANCHE COUNTY

Jolly-Ogg Oil Co.'s No. 1 Neeley, SE NE Sec. 24-3-10W... Drilling 2,733 ft.
Ashcraft and others' No. 1 School Land, SE cor. SE Sec. 20-2-10W ..... Broken sandy lime 822-954 ft.; swabbed 3 bbls.; total depth 975 ft.; shut down; material moved out.
Jenkins and others' No. 1 Smith, SW cor. SE SE Sec. 34-1-10W ..... Shut down 1,530 ft.
Green and others' No. 1 Wilson, C NE SW Sec. 14-1-12w.. Reaming pipe 3,315 ft.

COAL COUNTY

McGraw and others' No. 1 Patton, SW SE NE Sec. 35-1-8 ..... Drilling 1,600 ft.
Indian Territory Illuminating Oil Co.'s No. 1 Harris, SW cor. NW Sec. 10-1-11 ..... Will shoot to try and clean hole; total depth 1,725 ft.

OKLAHOMA PANHANDLE

CIMARRON COUNTY

Phillips and others' No. 1 Unknown, NW cor. NW Sec. 24-6-2 ..... Shut down 4,340 ft.
Sinclair Oil & Gas Co.'s No. 1 School Land, NW cor. NW Sec. 32-5-2 ..... 4,872 ft., will plug.
Ramsey Brothers' No. 1 School Land, NE SW SW Sec. 21-5-5 ..... Drilling 3,755 ft.
Ramsey Brothers' No. 1 Unknown, NW NE Sec. 27-5-5... Shut down 4,100 ft.
Ramsey Brothers' No. 1 School Land, SE SE Sec. 34-4-1.. Drilling 3,850 ft.
Gladys-Belle Oil Co.'s No. 1 Aerial, SW NE Sec. 25-3-7... Plugging 4,392 ft.
Valerius & Wilkinson's No. 1 Unknown, SE cor. NE Sec. 25-3-7 ..... Drilling 2,545 ft.
H. F. Wilcox Oil & Gas Co.'s No. 1 Zea, NE SW Sec. 28-3-13 ..... Shut down 3,765 ft.
Skaer and others' No. 1 Mathis, SW NE NE Sec. 17-3-23.. Drilling 3,227 ft.
Rose Fenton and others' No. 1 Graves, NE NE Sec. 2-2-9.. Spudded and shut down.

TEXAS COUNTY

Danner Oil Co.'s No. 1 Graves, NE cor. SW SW Sec. 23-2-18 ..... Shut down 700 ft.
Newsom and others' No. 1 Allison, SE SE Sec. 4-1-12 .... Shut down 4,040 ft.
Dotton and others' No. 1 Baker, C NW Sec. 4-1-13..... Rig blown down.
H. & H. Oil Co.'s No. 1 Hitch, NE cor. NE Sec. 26-1-15... Shut down 600 ft.
Three Way Oil Co.'s No. 1 Cane, SW NW Sec. 11-1-18... Hole full of water at 3,318-58 ft.; shut down.
Conley and others' No. 1 Unknown, SE cor. NW Sec. 5-1-19 ..... Spudded and shut down.
Texas County Gas Co.'s No. 1 Bacon, C NE NE Sec. 17-3-16 ..... 10,000,000 ft. gas 2,606-42 ft.

SOUTHERN OKLAHOMA

BRYAN COUNTY

Green Oil & Ref. Co.'s No. 1 Kemp, SE cor. NW NW Sec. 28-8s-9 ..... Shut down 600 ft.
Alexander & Oppenheimer's No. 1 Hampton, SE cor. NE Sec. 26-7s-11 ..... Shut down 1,425 ft.

JEFFERSON COUNTY

J. R. McCoy and others' No. 1 Smith, SE cor. NW Sec. 14-7s-6W ..... Rigged up and shut down.
W. Bassett's No. 1 Johnson, NE NW Sec. 15-6-8W ..... Location.
Amerada Petroleum Co.'s No. 1 Emerson, NW cor. SE SW Sec. 28-5s-8W ..... Drilling 1,232 ft.
Wirt Franklin Petroleum Co.'s No. 1 Foster, CNL NW SW Sec. 35-4S-4E ..... Drilling 400 ft.

CHOCTAW COUNTY

Hugo Gay's No. 1 Smith, SE cor. SW NW Sec. 27-4s-16.. Shut down 1,540 ft.
Choctaw Petroleum Co.'s No. 1 Wilson, SW cor. SW Sec. 15-6-19 ..... Shut down 1,346 ft.

TILLMAN COUNTY

Bray and others' No. 1 Barker, NE cor. SW NW Sec. 9-1-15w ..... Shut down 650 ft.
A. N. Pearson's No. 1 Mounts, SW cor. SW Sec. 3-4s-16w.. Rig.
Landfair and others' No. 1 Smith, SE SW SE Sec. 6-2s-16w ..... Shut down 2,440 ft.

MARSHALL COUNTY

Laurel Oil & Gas Co.'s No. 1 Chastine, SE NW Sec. 26-4s-5 ..... Dry and abandoned 4,190 ft.
Magnolia Petroleum Co.'s No. 2 Marshall, SW cor. NW SW Sec. 26-5s-7 ..... Dry and abandoned 730 ft.
Alter and others' No. 1 Brown, NE cor. NW NW Sec. 11-4-6 ..... Dry and abandoned 201 ft.

STEPHENS COUNTY

Pierce & Brown's No. 1 Garland, SE NW NE Sec. 34-2s-6W ..... Shut down 1,700 ft.
Ward, Martin & Smythe's No. 1 Vestal, NE cor. SE Sec. 7-3-7W ..... Rig.
Geo. Pace and others' No. 1 Absher, NW cor. NW Sec. 7-3s-7W ..... Rig.

JOHNSTON COUNTY

McPherson and others' No. 1 Wyand, CSL NE NW Sec. 7-2s-9 ..... Shut down 4,440 ft.
Wapanucka Oil Co.'s No. 1 Banks, Sec. 28-2c-9 ..... Shut down 1,530 ft.

CARTER COUNTY

Grooms and others No. 1 Morris, CSL NW NE Sec. 19-1s-2W ..... Shut down 3,463 ft.

MURRAY COUNTY

Thompson Oil Co.'s No. 1 Freeman, SE cor. Sec. 27-1s-2... Rig.
Gilcrease Oil Co.'s No. 1 Wolf, SE cor. NE Sec. 20-1-2.... Drilling 1,925 ft.
Revels & Magee's No. 1 Labor, NW cor. NW Sec. 17-1-2... Shut down 240 ft.
Alter and others' No. 1 Johnson, SW cor. NW Sec. 14-4-7.. Spudded.

LATTIMER COUNTY

Limestone Oil & Gas Co.'s No. 1 McMurray SW cor. SW Sec. 15-5-18 ..... Shut down 1,700 ft.

KANSAS WILDCATS

(Continued from Page 52)

DICKINSON COUNTY

Franks & Johnson's No. 1 Schlessner, C SW NE, Sec. 18-16-4 ..... Drlg., 840 ft.
Phillips Pet. Co.'s No. 1 Grayler, SE cor. NW, Sec. 11-14-4 ..... Underreaming casing 1,985 ft

ELLIS COUNTY

Derby Oil Co.'s No. 1 Weigel, C NW, Sec. 25-2-17w ..... Drlg., 1,650 ft.
J. H. Tatlock et als' No. 1 Leiker, NW cor. NE NE, Sec. 26-13-16w ..... Dry and abd., 3,507 ft

GEARY COUNTY

Pioneer Oil Co.'s No. 1 Chase, SE cor. SE, Sec. 10-12-7 .. Drlg., 2,089 ft.

GRAHAM COUNTY

Gulf Coast Oil Co.'s No. 1 Johnson, SE cor. NE SW, Sec. 27-8-25w ..... S.D., 3,460 ft.

GREENWOOD COUNTY

Eureka Oil Co.'s No. 1 Brothers, SE cor. NW, Sec. 35-23-11 ..... Drlg., 2,489 ft.
C. A. Devine's No. 1 Bradford, SW cor. NE Sec. 22-26-11. S.D., 600 ft.
Haniev et als' No. 1 Peterson, NW cor. NE SE, Sec. 4-26-13 ..... Drilling 800 ft.
R. H. Hood et als' No. 1 Butler, C SE SE Sec. 15-26-11. Drilling 900 ft.
T. C. Johnson's No. 1 Knox, NE cor. NW, Sec. 8-23-13 .. S.D., 1,705 ft.
Kismet Oil Co.'s No. 1 Richardson, SW cor. NE SW, Sec. 26-22-11 ..... Location.
O. W. Culy et al's No. 1 Hoover, NE cor. SE, Sec. 15-27-13 ..... Drilling 600 ft.
Rockhill et als' No. 1 Jones, SW cor. NE, Sec. 21-26-13.. Rig.
Sharpless et als' No. 1 Corper, SW cor. SE SE, Sec. 22-23-12 ..... S.D., 1,310 ft.
Smith & Rockhill's No. 1 McDair, NW cor. SE Sec. 20-26-12 ..... Dry and abd., 1,908 ft

HARPER COUNTY

Amerada Pet. Corp.'s No. 1 Mendiville, C SE SE, Sec. 24-34-6w ..... Drilling 4,990 ft.
Sam Jarvis' No. 1 Wyckoff, SW cor. NW Sec. 11-34-4w.. Drlg., 4,570 ft; flat hole; will shoot to straighten
Sam Jarvis' No. 1 Warneke, SE cor. SW Sec. 4-34-3w... S.D., 4,207 ft.

HARVEY COUNTY

Roxana Pet. Corp.'s No. 1 Haury, NE cor. SW SE Sec. 11-23-2w ..... Rig.

JEFFERSON COUNTY

Wichita Oil Co.'s No. 1 Simpson, NW cor. SW SW Sec. 19-10-17 ..... Rigged up and S.D

KINGMAN COUNTY

James Madison's No. 1 Ballein, SW cor. NW NW Sec. 21-28-5 ..... Drilling 3,680 ft.

LANE COUNTY

Robinson et als' No. 1 Dickerson, SW cor. NW SE Sec. 11-18-27w ..... S.D., 2,625 ft.

MARION COUNTY

Anderson Bros.' No. 1 Benth, SE cor. SW SW Sec. 31-18-5 Dry and abd., 2,620 ft
Franks et als' No. 1 Wright, SW cor. NW NW Sec. 9-14-4. Rig.
Gives et als' No. 1 Ucker, SW cor. NE, Sec. 31-17-4 .. U.R., 1,820 ft.
Graham Bros.' No. 1 Nelson, NE cor. SE, Sec. 30-17-5.. Sand, 2,295-2,380 ft; pumping 10 bbls; completed.
T. C. Johnson's No. 1 Thompson, SW cor. NE, Sec. 26-17-4 ..... Chat, 2,329-41 ft; fish, csg
Raymond Gear's No. 1 Larson, NW cor. SW NW Sec. 18-21-4 ..... Drilling 600 ft.
Shearer & Reardon's No. 1 Strouse, SW cor. NW NE, Sec. 14-18-4 ..... Rig.

MEADE COUNTY

Blackwell O. & G. Co.'s No. 1 Beyer, SE cor. NW SE, Sec. 9-33-28w ..... Shut down 3,475 ft.

MITCHELL COUNTY

Ben Gurley et als' No. 1 Crombil, C NE NE, Sec. 32-9-7w ..... Rig.

MORRIS COUNTY

Cress & Hawley's No. 1 Grendier, NW cor. SE Sec. 16-15-5 ..... Fish, tools, 1,400 ft
Hugh Faulder's No. 1 Wendt, SW cor. SE SE, Sec. 18-15-5 ..... Rig and tools.
Fisher & Louck's No. 1 Stroda, NW cor SE, Sec. 6-16-5.. Dry and abd., 2,659 ft
Franks & Farrell's No. 1 Wendland, SW cor. SE NE, Sec. 20-16-5 ..... Drilling 1,820 ft.
Graham Bros.' No. 1 Nelson, NE cor. SE Sec. 30-17-5 .. Drilling 1,600 ft.
Matthews et als' No. 1 Walters, SW cor. NE Sec. 14-15-5 Drilling 935 ft.
Moss & Nelson's No. 1 Smith, SW cor. SW Sec. 18-16-5.. Rig.
Skelton et al's No. 1 Ilea, NW cor. NW Sec. 25-16-5 .. Rig.

McPHERSON COUNTY

Phillips Pet. Co.'s No. 1 Wright, SW cor. NW NW, Sec. 9-19-4 ..... Drilling 875 ft.
D. I. Hall's No. 1 Gray, NW cor. SE NW, Sec. 20-20-3w . Spudded and S.D
John Heron's No. 1 Vosshell, NE cor. NE Sec. 9-21-3w.. Drilling 635 ft.
C. W. Lamer's No. 1 Lamer, SE cor. SW, Sec. 1-17-3w . U.R., 3,495 ft.
Gurley & Lamer's No. 1 Paulsen, SE cor. NW, Sec. 6-19-2w ..... Drilling 1,900 ft.
The Texas Co.'s No. 2 Chinberg, NE cor. NE NW Sec. 32-18-2w ..... Sand, 2,343-77 ft; swbd 35 bbls

OSBORNE COUNTY

Prather-Davis-Krueger's No. 1 Pruter, SW cor. SE Sec. 30-9-15w ..... S.D., 2,360 ft.

PAWNEE COUNTY

Frank Hopper et als' No. 1 Seifers, NW cor. SW NE, Sec. 23-21-11w ..... S.D., 4,170 ft.
F. C. Troupe's No. 1 Lovett, CEL NE NE, Sec. 3121-16w S.D., 1,700 ft.

POTTAWATOMIE COUNTY

J. J. Crawford's No. 1 College, CWL SW NE Sec. 11-10-12 S.D., 2,250 ft.

RENO COUNTY

Danciger O. & R. Co.'s No. 1 Williams, NW cor. SE SE, Sec. 6-22-4w ..... Moved in tools

RICE COUNTY

Allison & Fitzwilliams' No. 1 Poland, NE cor. SW NE, Sec. 36-19-8w ..... Cellar.

RILEY COUNTY

Mutual Oil Co.'s No. 1 Marks, SE cor. NE NW, Sec. 26-10-6 ..... S.D., 2,400 ft

ROOKS COUNTY

J. C. Findeiss' No. 1 Catudal, NW cor. SE SE, Sec. 23-10-19w ..... Rig.
Keys Pet. Co.'s No. 1 Rathburn, NE cor. SW, Sec. 14-9-16w ..... S.D., 3,030 ft.
Krueger et als' No. 1 Poore, NE cor. NE, Sec. 14-8-16w.. Spudded and S.D
Stearns & Streather's No. 1 Matheson, NE cor. SE NW, Sec. 28-10-16w ..... Drilling 3,479 ft.

RUSH COUNTY

Valerious & Chenney's No. 1 Sheverman, NW cor. SE NW, Sec. 27-17-17w ..... Spudded and S.D

RUSSELL COUNTY

Douglas Oil Co.'s No. 1 Stoppel, SE cor. SW NE, Sec. 25-14-11w ..... Rig.

SALINE COUNTY

Mente O. & G. Co.'s No. 1 Muir, SW cor. SW, Sec. 17-15-2w ..... U.R., 3,205 ft.

SEDGWICK COUNTY

Bu-Vi-Bar Pet. Co.'s No. 1 Wright, SE NE SE, Sec. 12-26-1w ..... Drilling 1,000 ft.

SEWARD COUNTY

T. B. Slick's No. 1 Pyle, NE cor. NE, Sec. 14-33-33w .. S.D., 3,200 ft.

SHERMAN COUNTY

A. L. Henson et als' No. 1 Murry, NE cor. SE NW, Sec. 22-7-4w ..... S.D., 2,650 ft

SMITH COUNTY

Smith & Buchner's No. 1 Rice, SW cor. SW, Sec. 18-5-15w ..... Rig.

STRATFORD COUNTY

Kismet Oil Co.'s No. 1 Richards, SW cor. NE SW, Sec. 24-22-11w ..... Location abd

SUMNER COUNTY

Helmerich & Payne's No. 1 Broadhurst, SE cor. NE NE, Sec. 15-33-3e ..... Timbers.
Otstot et als' No. 1 Barlow, SE cor. SE, Sec. 23-33-3w.. S.D., 1,860 ft.
Gypsy Oil Co.'s No. 1 Douglas, NE cor. SE NW, Sec. 23-34-2w ..... Top Wilcox, 4,493 ft; T.D. 4,500 ft; estimated 200 bbls; S.D

TREGO COUNTY

Central Commercial Oil Co.'s No. 1 Ellis, NE cor. SW NE, Sec. 20-13-21w ..... Spudded and S.D

WABAUNSEE COUNTY

Empire G. & F. Co.'s No. 1 Schusem, SE cor. SE, Sec. 19-12-11 ..... Fish., 2,320 ft.

KANSAS FIELDS

(Continued from Page 52)

Co. is building the rig for No. 9 Ott "A", SW cor. NE NW, Section 25-22-12. The rig is under construction for No. 12 Schwab, NE cor. SW NE, Section 25-22-12. No. 5 Schwab "B," SE cor. NE SW, Section 30-22-13, is a rig under construction. Skelly Oil Co. has the rig on the ground for No. 3 Schwab, SE cor. SW NE, Section 30-22-13. Polhamus and others moved a machine to the location for No. 1 Gopher, SW cor. SE SW, Section 35-25-10. Smith & Downard's rig is up for No. 1 Dickinson, SE cor. NE NE, Section 30-25-12. Brinegar and others moved a machine out for No. 1 Lawrence, NW cor., Section 10-27-13.

Empire Oil & Refining Co.'s No. 8 Ott "A", SE cor. NW NW, Section 25-22-12, made 145 bbls. after a shot of 180 quarts in sand 1,656-1,720 feet. No. 11 Schwab, CNL NW SE NE, Section 25-22-12, made 155 bbls. from sand 1,672-1,725 feet after a shot of 180 quarts. Skelly Oil Co.'s No. 1 Schwab, SW cor. NE, Section 30-22-13, was completed for 450 bbls. No. 2 Schwab, NW cor. SW NE, Section 30-22-13, made 100 bbls. from sand 1,689-1,733 feet. Mendenhall and others' No. 1 Grossart, NE cor. NW SW, Section 5-25-13, is shut in for 6,000,000 feet of gas in sand 1,484-93 feet.

McPherson County

Sinclair Oil & Gas Co. made location for No. 1 Clark, C NE SE, Section 31-18-2w.

Marion County

Glidden and others moved the rig out for No. 1 Riffell, SE cor. SW SW, Section 10-17-4, Lost Springs area. Phillips Petroleum Co. has the rig on the ground for No. 1 Ireland, NE cor. NW SE, Section 7-19-4.

Reno County

Empire Oil & Refining Co. and Marland Oil Co.'s rig for No. 1 Williams, SE cor. NE, Section 5-26-4, is up.

Russell County

Keys Petroleum Co. and others made location for No. 1 Mermis, NE cor. SE, Section 32-13-15w. Location was also made for No. 2 Mermis, NW cor. NE SE, Section 32-13-15w. Wilcox Oil & Gas Co.'s No. 4 Munsell, SW cor., Section 17-12-15w, has been shut in for 7,000,000 feet of gas in sand 2,422-32 feet.

Stafford County

Harper and others' No. 1 Siffers, NW cor. SW NE, Section 23-21-11w, is dry and abandoned at 4,176 feet.

Sumner County

Palmer & Barnsdall Oil Co.'s rig is being built for No. 8 Weinrich, SE cor. NE NW NW, Section 23-32-2. The rig is also being built for No. 9 Weinrich, CWL NE NW, Section 23-32-2. Wentz and others made location for No. 1 Crane, SE cor. NE NW, Section 23-34-2w.

Roxana Petroleum Corp.'s No. 4 Barnes, SE cor. SW SW SW, Section 14-32-2, Oxford Pool, was shot with 180 quarts and made 500 bbls. from sand 2,046-2,127 feet. Ramsey and others' No. 2 Caldwell, NE cor., Section 22-32-2, was completed for 200 bbls. in sand 2,138-95 feet.

MUSKEGON FIELD

(Continued from Page 59)

No. 1 A. Hinz, NW SE Section 8, 200 feet; Wa-je-sel Oil Co.'s No. 1 Reeths, SW SW Section 5, 600 feet; Joliet-Morris Development Co.'s No. 1 Kooi, 1,400 feet; and Dixie Oil Co.'s No. 1 Becker, SE SW Section 4, 1,100 feet.

Locations announced but not yet started are: Lima Oil Corp.'s No. 2 M. Figge, SE NW Section 9; Lima Oil Corp.'s No. 1 Haight, NE SW Section 9; Citizens Petroleum Co.'s No. 1 Kooi, SW SE Section 8; Muskegon Oil Corp.'s No. 2 H. Hinz, SE NE Section 8; Kelley Goldboss's No. 1 Burns, SE SE Section 5; and Charles P. Brandt's No. 1 Host, SE SE Section 5. The first four are on the flats below the bank overlooking the Muskegon River valley.

The Muskegon Oil Corp. and its subsidiaries, including the Citizens Petroleum Co., the Lake Shore Petroleum Co. and the Joliet-Morris Development Co. and the Dixie Oil Co., subsidiary of the Standard Oil Co. of Indiana, are preparing to drill a number of wildcat wells on territory under lease to the pioneer local company for more than a year in other parts of Muskegon County.

Acreage Leased

Leases on more than 2,000 acres in Moorland, Sullivan, Ravenna, Egelston and Fruitport Townships of Muskegon County have been assigned by the Muskegon Oil Corp. to the three subsidiaries this week. It is understood some of the acreage also will be assigned to the Dixie Oil Co.

It was announced that the Consolidated Oil Co., residents of Muskegon, will start drilling operations in Allegan Township in the immediate vicinity of the city of Allegan within 30 days. The company has leased about 10,000 acres, according to Jacob Bolema, president, including the property upon which four old test wells were drilled about 20 years ago. It is reported that one of these wells produced 10 bbls. and another 5 bbls. a day from the Berea at about 1,200 feet. The deepest was drilled to but 1,262 feet, according to records of R. A. Smith, state geologist. It is also reported there was enough gas flow from the wells to fire the boiler for drilling.

The company also has leased about 10,000 acres 10 miles east of Grand Haven in Ottawa County, where it expects to drill this summer. Officers in addition to President Bolema are: Vice president, Joseph Snyder; secretary, C. D. Kidder; and treasurer, John Noor.

The Ottawa Development Co. has abandoned its test well near West Olive at about 2,000 feet. Salt water filled the hole. Officials have not yet decided whether to drill another test near Waverly.

The Davis Co. of New Lexington have leased about 6,000 acres in Bangor and Geneva Townships of Van Buren County, and it is reported drilling will be started. Clover & Co., drillers from Lancaster, Ohio, have contracted to drill three or four wells for the Vermont Petroleum Development Co. near Decatur, Mich.

OKLAHOMA FIELDS

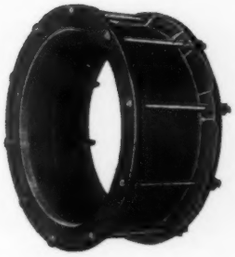
(Continued from Page 52)

Snowden-McSweeney:				
Tiger	13- 7-6	1	1,810	
Superior:				
Sokotheche	1- 7-6	1	13	
Texas:				
Coker	1- 7-6	3	550	
Tidal:				
House	1- 7-6	3	800	
Johnson	1- 7-6	1	70	
Total		115	47,751	
Maud Pool				
Barnsdall:				
Fife	14- 8-5	1	....	
I. T. I. O.:				
State	16- 8-5	1	....	
Total		2	....	
Bowlegs Pool				
Amerada:				
Roscoe	15- 8-6	8	1,655	
Atlantic:				
Baker	10- 8-6	4	350	
Fleet	23- 8-6	3	450	
Grayson	13- 8-6	4	600	
A. Jones	16- 8-6	2	90	
C. Jones	9- 8-6	2	180	
Barnsdall:				
McNac	28- 8-6	1	36	
Murrow	11- 8-6	4	639	
Carter Oil:				
Bowlegs	15- 8-6	4	1,375	
Burden	23- 8-6	3	285	
Harjoche	14- 8-6	6	650	
Hilly	23- 8-6	3	750	
Jones	11- 8-6	4	1,115	
McGelsey	21- 8-6	1	30	
S. Mecco	9- 8-6	1	25	
Melissa	9- 8-6	1	105	
Walker	15- 8-6	4	550	
Wise	23- 8-6	12	2,655	
Dixie Oil Co.:				
Culley	11- 8-6	1	245	
Empire:				
Lacy	14- 8-6	6	594	
Wise	23- 8-6	2	357	
Gypsy:				
Bowlegs	22- 8-6	1	190	
Bradley	9- 8-6	1	....	
Cumsey	10- 8-6	4	1,356	
Doser	7- 8-6	1	100	
Grayson	13- 8-6	4	947	
Harjoche	10- 8-6	2	1,893	
Jones	11- 8-6	1	267	
Walker	15- 8-6	8	1,745	
Wise	23- 8-6	3	230	
I. T. I. O.:				
Barnett	24- 8-6	2	387	
Barnett "B"	23- 8-6	1	204	
Billington	22- 8-6	5	932	
Bowlegs	22- 8-6	10	1,700	
Davis	13- 8-6	4	1,107	
Fay	13- 8-6	9	2,087	
Goforth	15- 8-6	12	1,463	

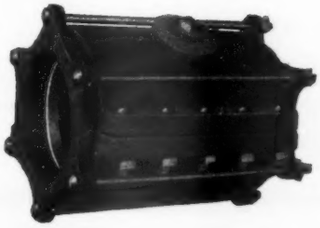
DAYTON
PIPE LINE REQUIREMENTS

No. 1
ALL STEEL COUPLING

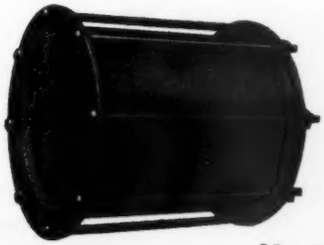
No. 8½ SPLIT SLEEVE



No. 4 COUPLING



No. 8 SPLIT SLEEVE



No. 5 SLEEVE

THE
NATIONAL SUPPLY
COMPANIES

HOPE

The Waskom Station includes 28 Hope Vertical 160 H.P. Gas Compresors—two 170 H.P. Hope Engine-Generators—one 250 H.P. Hope Engine-Generator—and Hope Scrubbers and Coolers.

The 310 miles of pipe line include 140 miles of 22-inch pipe, 76 miles of 18-inch pipe, 82 miles of 16-inch pipe, and 12 miles of 12-inch pipe—laid at an average rate of 2.8 miles per day.

During the line-testing period, the plant and line were operated at 400-420 lbs. discharge pressure, without evidence of strain or leakage.

SERVICE

AGAIN STANDS THE TEST

WHEN the Dixie Gulf Gas Company decided to bring gas from the northern Louisiana and Texas fields to Port Arthur and Houston, the Hope Company was entrusted with responsibility for delivering the completed job in the shortest possible time.

The station site was fixed on October 1st, 1927. The first concrete was poured October 20th. December 1st, seven Hope Vertical Compressors were ready for operation. December 15th the station went into action with 14 Hope Compressors ready. A little later, 14 more units were added. The first pipe was laid October 5th—the last pipe laid January 17th—310 miles of main and gathering lines, crossing 5 rivers, laid in 104 days. **As always, Hope Service stood the test of speed construction.**

HOPE SERVICE

Aid in organization and financing—market research — engineering counsel — design, construction, contracting—in pipe lines for oil or gas, oil pumping stations, gas compressing and booster plants, gasoline recovery systems, gas power stations, city and intercity gas mains.

—oOo—

ENGINEERS CONTRACTORS

HOPE ENGINEERING AND SUPPLY COMPANY

DESIGNERS MANUFACTURERS

MOUNT VERNON, OHIO, U.S.A.

NEW YORK, N.Y. DALLAS, TEX. TULSA, OKLA. CASPER, WYO.

HE 73

Livingston	15- 8-6	11	3,648
Lizzie	13- 8-6	3	377
I. T. I. O.:			
Walker	15- 8-6	8	888
Wilmott	15- 8-6	4	361
Work	24- 8-6	1	128
Youngblood	24- 8-6	2	172
Magnolia:			
Davis	13- 8-6	3	454
M. Davis	13- 8-6	1	231
Hammond	10- 8-6	3	960
Rhodes	12- 8-6	4	4,082
Van Buskirk	9- 8-6	1	329
McCulloch:			
Bowlegs	22- 8-6	2	420
Mid-Continent:			
Baker	10- 8-6	4	1,254
Bowlegs	22- 8-6	1	30
Smith	12- 8-6	6	435
Minnehoma:			
Bowlegs	15- 8-6	4	312
Prairie:			
Gahagan	23- 8-6	4	372
Harber	10- 8-6	8	2,630
Jones	11- 8-6	4	445
Templeton	12- 8-6	6	2,775
Whitney	23- 8-6	4	435
Pure Oil:			
Reed	14- 8-6	15	2,413
Strother "D" 11 &	14- 8-6	4	579
Strothers "F"	10- 8-6	4	1,861
Roxana:			
Taylor	16- 8-6	5	445
Shaffer:			
Lacy	14- 8-6	3	330
Sinclair:			
Bowlegs	22- 8-6	1	65
Cumsey	10- 8-6	4	3,522
Ellen	11- 8-6	7	1,050
Harjo	14- 8-6	3	605
Jones	9- 8-6	7	2,625
Taylor	10- 8-6	4	2,249
W. Taylor	10- 8-6	1	1,223
Walker	22- 8-6	4	1,000
Texas:			
Reed	14- 8-6	11	2,120
Tidal:			
Grayson	13- 8-6	4	580
Harjoche	10- 8-6	6	1,175
Twin States:			
Jones	11- 8-6	3	88
Total		313	69,628

Earlsboro Pool

Amerada:			
Anderson	15- 9-5	2	1,080
Cowden	4- 9-5	8	1,735
Rogers	3- 9-5	2	1,070
Atlantic & Sinclair:			
Foreman	18- 9-5	1	162
Barnsdall:			
Brown	10- 9-5	4	2,099
F. Bruner	2- 9-5	2	860
N. Bruner	10- 9-5	4	1,410
Cudjo	14- 9-5	1	26
D. Davis	11- 9-5	3	390
J. Davis	11- 9-5	4	1,251
M. Davis	11- 9-5	3	112
Gibson	9- 9-5	8	2,842
Hern	15- 9-5	1	4
Ingram	1- 9-5	8	3,445
S. Pack	10- 9-5	4	200
Peter	10- 9-5	4	174
Sango	1- 9-5	5	7,746
Sebolka	15- 9-5	1	482
H. Sullivan	11- 9-5	1	....
Sull-Harjo	10- 9-5	2	26
Wasutke	12- 9-5	4	2,251
Carter:			
Davis	13- 9-5	2	570
Payne	12- 9-5	3	15
Sango	1- 9-5	4	1,465
Continental:			
Kays	2- 9-5	2	....
Spencer	12- 9-5	4	1,150
Crosbie:			
Bryant	9- 9-5	2	....
Empire:			
Barker	12- 9-5	1	800
Edmondson	3- 9-5	3	660
Gypsy:			
Bora	16- 9-5	1	....
Bruner	10- 9-5	4	2,722
B. Carter	11- 9-5	9	3,242
Earl	16- 9-5	1	17
Hunick	5- 9-5	1	2,325
Noble	12- 9-5	4	2,937
Peter	10- 9-5	3	205
Sango	1- 9-5	5	4,337
State	16- 9-5	4	1,092
Independent:			
Bruner	10- 9-5	4	430
Sullivan	10- 9-5	3	117
Knapp	8- 9-5	4	2,175
Independent-Margay:			
Gains	11- 9-5	4	900
Interocean:			
Payne	12- 9-5	1	....
Magnolia:			
Bryant	9- 9-5	6	1,333
Cowden	4- 9-5	4	70
Dixon	12- 9-5	1	....
Edmondson	3- 9-5	3	25
Holmsley	11- 9-5	8	1,624
Hyde	13- 9-5	1	1,802
Ingram	10- 9-5	1	30
Lena	10- 9-5	3	75
Seay	12- 9-5	9	4,027
Simpson	10- 9-5	3	251
Sparks	11- 9-5	7	617
Sullivan	12- 9-5	3	140
Mid-Continent:			
McCumber	9- 9-5	7	405
Mid-Kansas:			
Anderson	14- 9-5	3	150
Phillips:			
Dunaway	14- 9-5	1	30
Gram	9- 9-5	3	145
Prairie:			
Baker	24- 9-5	1	50
Davis	13- 9-5	5	2,585
C. Graham	3- 9-5	2	45
O. Graham	10- 9-5	4	1,425
Stidham	11- 9-5	13	4,440
Roxana:			
Bayless	17- 9-5	1	15
Spencer	13- 9-5	2	1,167
Shaffer:			
Clark	1- 9-5	5	774
Sinclair:			
Foreman	18- 9-5	1	....
Hollins	12- 9-5	2	20
Sango	2- 9-5	3	4,705
Skelly:			
Sherry	6- 9-6	1	76
Spencer	13- 9-5	1	842
Superior:			
Walker	2- 9-5	1	....
Texas:			
Anderson	3- 9-5	7	795
Brown	10- 9-5	8	1,925
Rogers	5- 9-5	4	3,595
Wilmott	10- 9-5	7	957
Tidal:			
Watkins	9- 9-5	8	3,010
Twin States:			
Barker	12- 9-5	3	100
Hern	2- 9-5	4	1,815
Total		286	92,219

Seminole Pool

Amerada:			
Fixico	23- 9-6	4	1,017
Killingsworth	23- 9-6	4	396
Rentie	23- 9-6	2	687
Atlantic:			
N. Cudjo	35- 9-6	3	350
Barnsdall:			
Carter	24- 9- 6	8	825
Henry	14- 9-6	2	526
Jones	34- 9-6	4	425
Carter Oil:			
B. Carter	24- 9-6	2	220
F. Carter	23- 9-6	3	72
J. Carter	24- 9-6	3	25
Creamer	34- 9-6	2	30
R. Cudjo	35- 9-6	4	160
W. Cudjo	35- 9-6	1	30
Gilliland	27- 9-6	1	350
Grisso	23- 9-6	5	570
M. Grisso	15- 9-6	1	290
G. F. Killings	14- 9-6	4	455
M. E. Killings	23- 9-6	12	5,935
Knapp	13- 9-6	3	53
Lukes	27- 9-6	6	1,220
Pounder	34- 9-6	2	37
Simpson	35- 9-6	2	38
Strothers	34- 9-6	4	385
Vierson	23- 9-6	2	325
Empire:			
Gross	25- 9-6	3	57
Wilson	34- 9-6	2	200
Gypsy:			
Butler	35- 9-6	4	815
Carter	24- 9-6	8	550
Cudjo	34- 9-6	5	715
Fixico	26- 9-6	7	200
Harjo	25- 9-6	3	1,037
Wolfe	26- 9-6	6	240
Independent:			
P. Fixico	23- 9-6	3	275
Harjo	25- 9-6	2	210
Butler	35- 9-6	3	880
T. Fixico	26- 9-6	8	660
Jones	26- 9-6	4	468
I. T. I. O.:			
Allen	25- 9-6	2	172
Bowlegs	26- 9-6	12	2,819
Goodin	23- 9-6	4	408
Harjo	23- 9-6	3	105
James	24- 9-6	2	271
Reed	24- 9-6	1	10
Kingwood:			
Johnson	22- 9-6	3	1,351
Magnolia:			
Boren	2- 8-6	1	20
Franks	25- 9-6	4	780
Mid-Continent:			
Rentie	14- 9-6	9	720
Tayeche	24- 9-6	7	275
Mid-Kansas:			
Johnson	25- 9-6	2	20
Phillips:			
Strothers	27- 9-6	2	170
Prairie:			
Gross	25- 9-6	5	90
Mason	36- 9-6	1	80
Spencer	13- 9-6	1	12
Strothers	27- 9-6	8	1,460
Pure Oil:			
Strothers	26- 9-6	17	6,065
B. Strothers	36- 9-6	5	1,792
C. Strothers	34- 9-6	1	489
Roxana:			
Harper	22- 9-6	2	259
Lasley	22- 9-6	2	25
Sinclair:			
Carter	13- 9-6	2	25
Cudjo "A"	35- 9-6	6	915
Cudjo "B"	35- 9-6	4	1,290
Dicey	22- 9-6	2	1,215
Fixico	23- 9-6	4	1,060
Slick:			
Cudjo	35- 9-6	3	720
Franks	35- 9-6	7	1,886
Giblet	35- 9-6	3	1,658
Tiger	1- 8-6	1	51
Superior:			
Cudjo	35- 9-6	4	267
Texas:			
Mayhue	14- 9-6	1	300
Strothers	2- 9-6	1	135
Tidal:			
Carter	24- 9-6	4	680
Fixico	26- 9-6	6	1,137
Harjo	25- 9-6	3	690
T. Harjo	23- 9-6	6	130
Mahardy	24- 9-6	2	26
Turman:			
Cudjo	35- 9-6	4	971
Grisso	35- 9-6	1	262
Jones	34- 9-6	4	1,296
Total		304	52,835

Searight Pool

Amerada:			
Johnson	4- 9-6	1	70
Strothers	3- 9-6	2	1,020
Carter:			
Davis	4- 9-6	6	955
Frazier	3- 9-6	6	2,850
Johnson	3- 9-6	1	3
Kiker	2- 9-6	1	25
Mandler	3- 9-6	2	20
Scott	26-10-6	1	20
Gypsy:			
Cudjo	4- 9-6	3	410
Mid-Continent:			
Grayson	34-10-6	6	60
Davis	33-10-6	4	950
Pine:			
Lula	4- 9-6	1	27
Prairie:			
Cannon	33-10-6	1	10
J. Carter	10- 9-6	1	15
Houch	33-10-6	1	4
Kincaid	33-10-6	5	65
Varnum	5- 9-6	1	....
Wimer	33-10-6	1	45
Pure:			
Aldridge	3- 9-6	4	3,725
Roxana:			
Strothers	3- 9-6	4	1,136
Sinclair:			
Polly	3- 9-6	4	1,850
Superior:			
Varnum	4- 9-6	1	63
Texas:			
Fleet	4- 9-6	1	40
Twin States:			
Varnum	4- 9-6	2	340
Wilcox:			
Chupco	4- 9-6	8	1,695
Total		68	14,396

Totals		
Field—	Wells	Prod.
Little River	115	47,751
Maud	2	....
Bowlegs	313	69,628
Earlsboro	286	92,219
Seminole	304	52,835
Searight	68	14,396
Grand total	1,088	276,829

ROCKY MOUNTAIN AREA

(Continued from Page 62)

rigging up rotary at 70 feet, and its No. 3 Adair, SW cor., Section 8-6-86, is back on production after being deepened to 3,020 feet. Same company's No. 2 Henry Dennis, NW NW, Section 17-6-86, is making 10 bbls. a day on the pump after being deepened to 3,030 feet.

In Rio Blanco County, the Texas Production Co.'s No. 1 Freeman, Section 27-3-94, Wilson Creek Dome, is expected to be making new hole within a few days. It is bottomed at 5,567 feet and underreaming the 6¼-inch at 5,563 feet. It has about 250 to 300 feet to go to reach the Dakota.

In Baca County in the southeastern part of the State, the Marland Production Co.'s No. 1 Mesa, Section 8-30s-50, on the Table Mesa structure, commenced spudding and is cementing pipe at 77 feet. It is to be a Pennsylvanian test and will be drilled to 3,500 feet with rotary tools.

In Las Animas County, the Phillips Petroleum Co.'s No. 1 Haskins, Section 23-29-56, Red Rocks structure, is drilling at 1,685 feet in a lime formation. The Model Oil Co., which recently took over the Foley & Goldsworthy test on Section 11-30-60 on the Model Dome, has made arrangements with the Parker Club to have its drillers run the tools and determine the condition of the hole with a view to making a contract for its completion. The well has been idle at 2,010 feet.

In Larimer County the Five Square Oil & Gas Co.'s No. 1 State, SW SW, Section 16-4n-69, Berthoud Dome, is drilling at 2,250 feet and carrying the 8¼-inch casing which will be set at around 3,000 feet. This well is about half a mile south of the same company's No. 1 Fagin, which is shut in as a gasser and is running about 50 feet higher based on the Hygiene which was topped at 200 feet.

In Huerfano County, in the southern area, the Huerfano Oil Co.'s No. 2 Oak View, Section 10-29s-69, shut down for the winter at 910 feet, is making hole at 1,140 feet. This well is an offset to No. 1 Oak View, which had considerable gas, but which was not completed on account of a bad hole. The gas is being used for fuel in drilling No. 2. The Panuco Exploration Co., which drilled the first well is interested in No. 2.

Arapahoe County

In Arapahoe County, the McDeb Drilling Co.'s No. 1 Fitzsimmons, Section 7-4s-66, near Aurora, is running 8¼-inch casing at 3,350 feet. The 10-inch was set at 3,080 feet.

In Elbert County, the J. M. Botts' No. 1, SE SE, Section 1-8s-59, is drilling at 1,800 feet. This test is reported to have had considerable gas in shale at 800 to 1,100 feet, the gas continuing for the entire distance, but no sand was found. The gas has been cased off. It was inflammable and caught fire and burned one of the drillers slightly.

The Royalty Producers & Refiners Co. has been incorporated in New Mexico by Frank Webber and associates and is planning to make another test of the Red Mesa area in La Plata County. An interest has been acquired in the tools and drilling equipment of the Mesa Verde Oil & Gas Co., which drilled No. 1 Pullman on the structure, and contracted with that company to drill the well, but final location has not been made.

A new test of Moffat County is announced by the Giant Ledge Oil Co., of Denver, of which A. Guy Wakefield is president; A. O. Maltby, vice president, and L. R. Gilchrest, secretary and treasurer. This company has contracted with the Matador Oil Co. of Texas for a test to be drilled on the Skull Creek anticline in western Moffat County. The exact location has not yet been made, but will be in Section 15-4n-101. Contract calls for drilling to start in 45 days. John W. McGee geologized the structure for the Giant Ledge company. It is to be a Pennsylvanian test, the surface being a sand formation of Pennsylvanian age.

Montana

The first natural gas was turned into the Great Falls mains last Wednesday. At the same time, a protest was filed in Helena against the proposed rate schedule for natural gas in Great Falls and a legal fight looms. The natural gas is being delivered to the customers in Great Falls through the city mains that were used for manufactured gas. The orifices for the manufactured gas are large and this causes the natural gas to burn with a reddish flame. The gas employes are rapidly changing the fixtures. The Great Falls pipe line is 111 miles long, laid with 12-inch pipe over the greater part and cost $2,000,000.

Work on the Baker-to-South Dakota gas line, from the Baker Field in eastern Montana to towns in the Black Hills region in South Dakota, is to start shortly. This line is to be completed by December. Four other pipe lines are being constructed or are to be started shortly in the Rocky Mountain region.

The Shelby Pipe Line Co. brought charges before the railroad commission against the Illinois Pipe Line Co. charging that the Illinois company was charging excessive rates for the transportation of crude from the Sunburst Field. The commission examined the books of the Illinois Pipe Line Co. and held that the Illinois company was making only a normal profit.

One of the most important decisions in international oil field operation has been rendered by the Canadian government in the matter of the Rogers Field in Alberta. The Canadian government has ruled that the Rogers Field is likely to prove an international field because it is located close to the Canadian-Montana boundary and therefore should be no attempt on the part of the Canadian government to prevent export of the field's production. To this end the Canadian government has issued a permit to E. B. Coolidge, to pipe gas from the Rogers Field in Canada to Montana points. The Rogers Field lies about 30 miles east of Coutts and just across the boundary. The Range Oil & Gas Co. took over a large block of leases there and drilled a deep well that has a heavy rock pressure and a flow of gas estimated at 60,000,000 feet daily. There is no market on the Canadian side.

Pondera Field

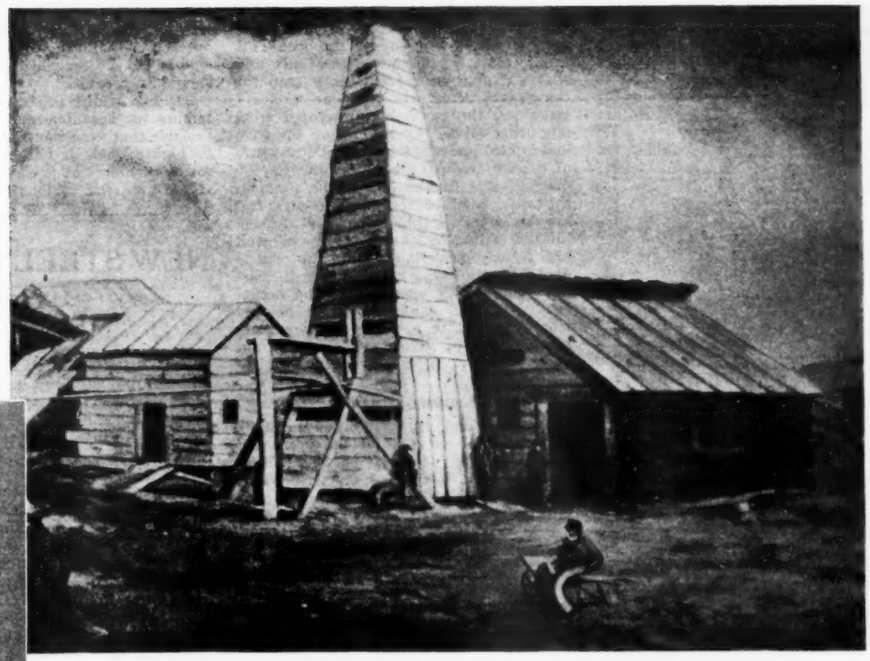
The Pondera Field north of Great Falls has had the southeast side of the field outlined by the Fulton Oil Co.'s No. 2 well. This hole came in a duster the past week and unless it is located on a dry spot, it appears to mark the southeast boundary of the new field.

The Chicago, Milwaukee & St. Paul Railroad has decided to build a short line to the Pondera Field in case the development keeps up as it promises and the Snowcap Oil Co.'s refinery is to be started shortly. This plant will have a capacity of 500 bbls. daily.

The California Petroleum Co. has purchased 30 per cent interest in some 4,000 acres in Pondera from the Treasurebelt Petroleum Co., a local organization. The remaining 70 per cent is owned by the Clagget Oil & Gas Co. and negotiations are under way for the California Petroleum Co. to take over the Clagget holdings also.

The Genou Oil Co.'s well in Pondera was given a test on the pump last week and made an average of 85 bbls. daily.

No completions of importance were made in Sunburst. The Aetna Oil Co. has a gas well on Section 9-34-2, and the Hannah Porter No. 1 on the Mulroney is holding up at 200 bbls. The Dakota Montana's well on the Peterson lease, in Section 17-34-1, is still holding up at about 1,600 bbls. daily. The Etheridge



An old photograph of the Drake Well, the first oil well in the world, drilled in 1859 by Colonel Edwin L. Drake, near Titusville, Pennsylvania

Crude tools like these were used by Colonel Drake in drilling the famous Drake Well.

The First Oil Well—

Drilled With Crescent Hammered Bit and Jar Steels

BROUGHT in on August 28th, 1859, the famous Drake Well near Titusville, Pennsylvania, was the first oil well in the world. At 69 feet, the Drake Well pumped twenty barrels of oil a day.

For drilling tools for the first well, Colonel Drake called on the nearby Crescent Works. Other pioneer drillers, too, brought their tool problems to the Crescent Works, which, with the growth of the oil industry, practically concentrated its efforts on the development and production of oil well drilling steels.

In the ensuing sixty-nine years, Crescent Hammered Bit and Jar Steels have made more hole than any other bit and jar steel. Through unexcelled performance, keeping to gauge longer, requiring fewer re-dressings and making more hole per inch of bit, Crescent Hammered Bit and Jar Steels have earned an enviable reputation wherever hole is made.

Crescent Hammered Bit Steel

Furnished in all sizes, in plain sections, or with tong holds drawn to any diameter or taper.

Crescent Hammered Jar Steel

Furnished in all sizes, with corners knocked down, nicked in center if desired, and to any length.

Crescent Hammered Jar Capping Steel

Furnished in all sizes with corners broken down Readily welded and heat-treated.

Calumet Box and Pin Steel

Furnished in all sizes; cut in short pieces if desired.

Max-El Slip Steel

When properly heat-treated, it is possible to obtain great toughness and high physical values; furnished in all sizes and carburizing and straight hardening analysis.

Max-El Socket Steel

The best for swivel and stiff sockets; when properly heat-treated, results in high tensile values coupled with toughness resulting in greatest resistance to battering and wear. Furnished in any size, rounds or in billets.

CRUCIBLE STEEL COMPANY OF AMERICA

General Offices: 17 East 42nd St., New York, N. Y.

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Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Montreal, Cleveland, Denver, Detroit, Hartford, Indianapolis, Milwaukee, Toronto, New Haven, New York, Philadelphia, London, Pittsburgh, Providence, San Francisco, Seattle, Springfield, St. Louis, Tokio, St. Paul, Syracuse

Crescent Hammered Bit & Jar Steel

Steel well No. 2 on Section 12-34-2, is making about 600 bbls. with some water.

ROCKY MOUNTAIN PRODUCTION
Runs from the Field, Week Ending May 5

Wyoming	
Salt Creek	40,040
Big Muddy	2,750
Grass Creek	2,580
Elk Basin	1,130
Greybull	20
Rock River	2,690
Lance Creek	740
LaBarge	840
Poison Spider	1,240
Hamilton	1,220
Oregon Basin	460
Osage	380
Lander	610
Ferris	100
Byron	50
Lost Soldier	5,150
Simpson Ridge	50
Total Wyoming	60,050
Montana	
Cat Creek	1,780
Lake Basin	150
Kevin-Sunburst	9,800
Total Montana	11,730
Colorado	
Florence	1,465
Moffat	1,602
Fort Collins	2,905
Iles Dome	341
Rangely	100
Tow Creek	429
Boulder	25
Total Colorado	6,867
New Mexico	
Rattlesnake	414
Hogback	510
Table Mesa	61
Artesia	1,218
Maljamar	207
Total New Mexico	2,400
Total Rocky Mountains	81,047

GAS SANDS IN THE SOUTH TEXAS FIELDS

(Continued from Page 80)

been formed because of the superior resistance to erosion of the limestone of the Reynosa. Along this escarpment, many of the oil and gas pools of the district have been located, among these being Lucas, Carolina-Texas, and the oil fields of the Mirando City area.

The Cole Pool is located on the Reynosa formation but not on the escarpment, being located about 8 miles toward the coast from the escarpment. However, there is a slight escarpment within the Reynosa formation extending intermittently from the north edge of the Cole Pool south for several miles.

Local Conditions

The gas pools of South Texas seem to be located on uplifts of an anticlinal nature. Production on these highs is governed almost entirely by sand conditions, that is, where a porous sand is found on the uplift, gas wells up to around 90,000,000 feet daily open flow capacity are brought in. Many wells drilled on locations favorable as to structure find no porous strata and are dry.

There are very few dependable indications of surface structure. Most of the wells have been located because of gas showings in shallow water wells or on topographic highs. Owing to the character of the surface material and existing information, local dips or the correlation of sands in shallow water wells are very misleading. The best surface reflection of subsurface structure is found at Lucas, in Live Oak County, where a large inlier of Oakville sand is found protruding through the overlying Lapara, Lagarto and Reynosa formations. This structure was blocked and drilled by the Houston Oil Co. of Texas upon the field work and recommendations of our chief geologist, Mr. Henley. Although the first well found gas and a large gas pool has been opened, production has not followed the outlines of this inlier because of the lenticular nature of the sands in the producing horizon.

By the wording lenticular sands the writer does not mean lense shaped in the strict sense of the word, but more the fact that laterally the sands often grade quickly into shales or hard sandy limes so that adjoining wells often miss the sand and find another producing sand at a different level or may miss the producing sands entirely. Especially is this true of the sands at Kingsville, Refugio, White's Point and Lucas.

The sands in the pools farther south in the Laredo district are not so lenticular and run fairly regular in places. It is noticeable that the producing sands in the pools of the Laredo district are generally more regular in a general north and south direction, probably a little less regular toward the east and very lenticular toward the west edge of the pool. This lensing of the sand into tight limes and shales on the west furnishes a trap for the gas in effect the same as a closed structure, the gas being prevented from migrating farther up the dip on the west and is held under the hydrostatic pressure of the water on the east. In the Laredo district, this lensing out of the sand on the west edge of the pools occurs frequently along certain fairly well defined lines, so that by careful study of well logs it may be defined before the pool is drilled up and thus be of service in leasing and drilling operations. The actual conditions and causes for this belongs more properly to a paper of more technical geological nature which might not be of interest outside of the geological profession.

Lensing of Sands

Faulting and fracturing may control the west edge of some of the pools and in some cases probably does so; however, it is the opinion of the writer that probably most of what is thought to be faulty displacement is really this lensing out of the sands. Many other geologists of the area, however, differ and think that faulting is more common and sand lensing plays a lesser part. This, though, is more or less academic, as the ultimate effect is the same.

Sometimes a sand may be found where expected; it will be porous but apparently perfectly dry and devoid of any oil, gas or water, whereas in a region such as this, where the rocks are filled with water under hydrostatic pressure, any porous reservoir should be filled with either gas, oil or water. Such is not always the case in this area, and it occurs with too much regularity to place the cause on mechanical difficulties. In one well at Cole-Bruni, we made eight tests with a patent tester through 26 feet of sand before finally obtaining a gas well in the last four feet and on the eighth test. The other test, made at intervals of about two or three feet, were dry. The formation consisted of porous sand separated at intervals by hard limey sand.

The sands of the district consist of coarse to fine-grained sands, the grains composed principally of quartz and chert. These grains are usually loosely cemented with a very slight coating of lime. The cap rock and other hard streaks in the sand are generally a sand cemented tight and hard with lime. Sometimes, silica cements the sand grains and if the pore spaces are entirely filled, it forms very hard quartzites. Generally, part of the pore space between the gas sand grains is filled with shales, clays, volcanic ash and bentonitic material, the bentonitic material being a form of volcanic ash. The bentonitic material is especially objectionable, as it slacks rapidly in water, expanding to several times its original volume and absorbing water many times its weight; by thus expanding it might seal off the pore spaces in the sand adjoining the drill hole, thereby effectively sealing off an oil or gas sand. This idea, so far as I know, first occurred to Mr. Paul McFarland of the Sun Oil Co. He persuaded his company to drill in some of their wells in the Aviator Pool with oil as drill fluid instead of water. I think that with this method they obtained some small wells where the previous tests had been dry.

The gas pressures and the hydrostatic pressure of the water in the oil sand is subnormal in the Laredo area. The hydrostatic level of water in the oil sands is probably not over 150 or 200 feet above sea level, while the surface has an elevation of 700 or 800 feet. The initial pressures of the gas pools just about correspond to this hydrostatic pressure. This subnormal pressure might be attributed to one of the three following causes:

1. The elevation of the outcrop of the beds or the water intake, thus, it may be that the elevation of the sands where they outcrop is not sufficient to raise the hydrostatic level higher. Topographically, the gas fields of the Laredo district are in general higher than the outcrop of the gas-bearing formations. The outcrop of the formations, I think, is high enough that the hydrostatic pressure should be greater.

2. The aridity of the climate may contribute to the subnormal pressure. It is possible that even though the outcrop may be high enough as not to be accountable for the subnormal pressure, that the low rainfall of the region does not furnish enough water to fill the beds up to the outcrop level.

3. The non-outcropping of the sands may be the cause of the subnormal pressures. The association of non-outcropping with subnormal pressures was first suggested to the writer by Paul Weaver. It may be that as the sands do not outcrop at the surface, no water has reached them since deposition and upon the tilting of the beds, the water level has dropped back to approximately sea level.

NEW STEEL PRODUCTION RECORD IN FIRST FOUR MONTHS OF YEAR

By B. E. V. Luty

PITTSBURGH, Pa., May 7.—Line pipe inquiry has been quite active lately, as previously noted. It has often been remarked that it was the large amount of line pipe business last year that kept the pipe mills from having a poor year from the standpoint of tonnage and also of earnings. There have been various small and moderate sized orders placed in the past few months, but until now nothing really big has been in the market. Altogether there have been four large natural gas lines more or less talked of for months, to extend respectively to Kansas City, Omaha, Memphis and St. Louis.

Demand for casing and other well material has been increasing somewhat with the progress of the season and is perhaps as heavy as it was at this time last year, but it is not nearly as large as in 1926, which now stands out as an exceptional year. Even then, however, the capacity of pipe mills was not taxed at any time except in the case of the largest sizes.

Pipe Shipments Heavy

Shipments of standard pipe have been very heavy since early in April but it is difficult to segregate and determine how much of the increase was due to natural seasonal improvement and how much was due to the price advance made at the beginning of the month, regular jobbers being allowed to cover for 30 days at the old prices. It has been reported that in some instances jobbers were allowed to cover for 60 days, but this is considered exceptional and a species of price shading, attributed to some of the smaller mills. The advance, which amounted to about 5 per cent, as it was made by dropping one five from the trimmings, has been paid right along by occasional buyers and is regarded by the pipe mills as in full force.

There has been relatively lighter new buying in the steel trade for some time past, but specifications and shipping orders on old contracts enabled mills to maintain substantially their high operating rate of March until late in April. There was a slight decrease in steel production the last week of April and there has been a little further decrease since then, with all probabilities of further decreases, seasonally, into July.

What distinguished this year from its four predecessors was the maintenance of practically peak production well through April, for in each of the past four years decreases began about April 1. The difference seems to have been made by those lines in which there were certain prices on first quarter contracts and higher prices on second quarter contracts, particularly bars, shapes, plates and wire products. Naturally, there was heavy specifying on the earlier contracts and shipments extended beyond the end of the quarter.

Rate of Production

Steel production in the first four months of the year was, say 3 per cent, above that in the same period of last year and somewhat above that in the first four months of 1926, whereby there is a new record to date. Heavy shipments lately seem to have been partly at the expense of this month and next, and there is therefore a possibility that the lead will be lost and that the half year will not make a record for such period.

Steel prices are holding quite well at most points, but not at all. Sheets have weakened further. They have now lost all of the ambitious advance the mills attempted a few months ago and there is a little doubt as to whether they may not average even a shade below the low point of late last year. Not a great deal of tonnage was actually sold at advanced prices, buyers being so well covered by contracts. Nails are almost nominal at the $2.65 price, jobbers having stocked up well early in the year at the lower prices.

The scrap market has been decidedly dull. For a time there was excitement among dealers as mills had called for heavy deliveries on their contracts, and dealers paid premiums, but now they are picking up supplies at close to the old prices, while mills show little inclination to buy. Valley pig iron remains dull. Basic, formerly nominal at $17, is now quoted at $16.50, valley furnaces.

PREPARE PROGRAM FOR COLORADO SPRINGS

(Continued from Page 38)

velopment and Production Records and Nomenclature, A. C. Rubel, chairman.

Committee on Production Technique, C. E. Beecher, chairman.

Committee on Drilling Technique, H. H. Anderson, chairman.

Committee on the Compilation and Correlation of the Regional Reports of the Technical Subcommittee of the American Petroleum Institute Gas Conservation Committee, Earl Oliver, chairman.

Committee on Development and Production Research, Dr. W. P. Haseman, chairman.

Committee on Metallurgy of Oil Field Equipment, Harold W. Fletcher, chairman.

Evening Session

Meeting of General Committee of Development and Production Engineering.

On June 15 general group sessions will be held morning and afternoon.

Morning Session

Special papers on selected topics. Immediately after the presentation of each paper, open discussion will be invited.

"Notes on Operating Practice in the Rocky Mountain District"—Fred E. Wood, Midwest Refining Co. (production practice in the Rocky Mountain district).

"Methods of Effecting Gas Conservation and Increased Recovery Efficiency in Ventura Field"—T. E. Swigart, Shell Oil Co. of California (Production and Gas Conservation in California).

"Increased Recovery Efficiency and Its Effect on Ultimate Production"—H. N. Marsh, General Petroleum Corp. of California (Production and Gas Conservation in California).

Afternoon Session

"Absorption and Its Effect on Gas Production and Injection"—Frank E. E. Germann, University of Colorado. (Scientific Aspects, National in Scope).

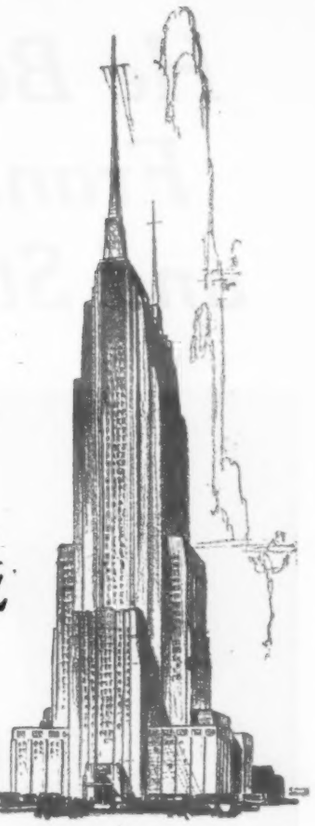
"Drilling and Production Methods in West Texas Fields"—H. J. Vance, Marland Oil Co. (Texas Drilling Practice).

"Deep Cable Tool Drilling Practice in the Eastern Fields"—J. F. Robinson, Peoples Gas Co. and J. G. Montgomery, Jr., United Natural Gas Co. (Drilling in the Eastern District).

The program for the Division of Development and Production Engineering was prepared by its program committee, T. E. Swigart, chairman.

The perspective of Time

GIVES IMPRESSIVE ACHIEVEMENT to Axelson Sucker Rods



Towering ,,, into the sky, the skyscraper was not built in a day. Watching the workmen toil in the pit, you see no phenomenal change over night. But glance at the location later. The steel girders begin to shape. Week by week the framework rises upward. Finally the peak is reached.

The Axelson structure has been 36 years in the building. Hardly a month has passed but that some proven betterment has been placed into service, without exploitation. ,,, Each improvement is in itself a small part of the *ensemble* but in the aggregate over a period of time reflects *impressive achievement.*

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

For instance, here are a few of the improvements introduced during the past two years:

1. The processing of a highly technical sucker rod steel, to permit new standards of accuracy in finishing and to exceed the field requirements that may be put in practice in the future.
2. Heat treatment by an intricate process that has been subjected to many years of research and testing.
3. Inception of an intricate, though simple, process for obtaining absolutely uniform pins and couplings mechanically.
4. Greatly refined process of adhering to perfect tolerance limitations.

We are manufacturing both A. P. I. and Standard Axelson Sucker Rods

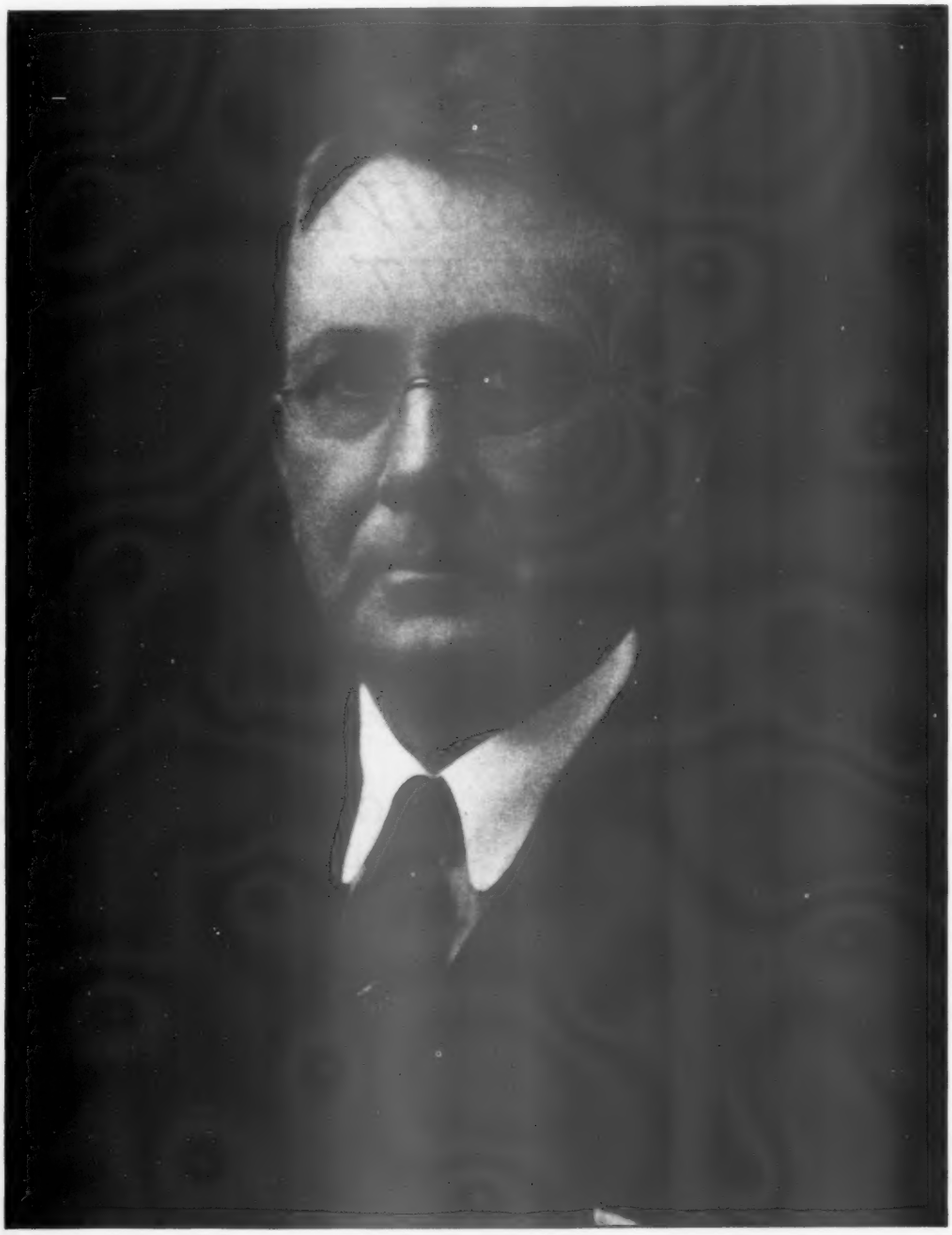
No matter how durable your old Rods, the present Axelson Rods will give many months of added service. ,,,,,, Performance tells the story.

Axelson Machine Co.

P.O. Box 337, Los Angeles
Tulsa, St. Louis, New York City

Mid-Continent Distributors ... Frick-Reid Supply Co
Eastern Distributors ... Frick & Lindsay Co.

He Bought the First Franklin Valveless and Still Buys Them!



Read His Entire Letter

July 26, 1927.

Franklin Valveless Engine Co.,
Franklin, Penna.

Gentlemen:

One day last week my attention was called to the advertisement of a drilling engine, and the success it had had in certain fields which caused me to wonder if the contractor had ever seen the Franklin Valveless Engine in operation.

The writer in his experience with engines in Penna., the deep sand of S.E. Ohio, the Texas Panhandle, western Kentucky, and western Wyoming has never seen an engine which fills the bill when called upon under the condition of the several fields named to compare with the Franklin Valveless Engine.

After seeing the test under pony break leverage of the first engine built by your Company in 1911, the writer purchased it and installed it in Tionesta, Penna. The engine has been running ever since and sometimes pumping 23 wells at one time, and to date has had comparatively no repairs.

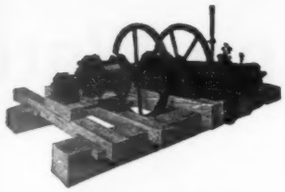
I shipped a carload of these engines to S.E. Ohio for operations in Clinton sand at 3400 ft. depth and they did the work much more satisfactorily than other engines in the field, and we were requested by your company to try out your drilling engine.

It gives me the greatest pleasure to write you even at this late date, that the engine drilled our No. 11 on the Cobb & Bradley Lease to the depth of 3400 ft. in 28 days, not deducting any time for running two strings of casing. The time saved in pulling out and bailing, over other engines, has been so remarkable that we immediately adopted its use and placed a large order with your company, and have just finished Well No. 16 with the same satisfactory results. There are several engines yet to be delivered on this contract which will be used with a great many more, and I am pleased that other contractors in the different fields are getting the same results with your engine and I cannot recommend it too highly.

Respectfully yours,
Arthur H. Squier

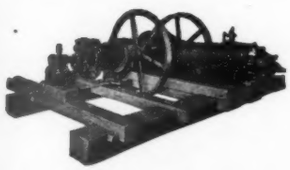
s Oil and Gas Engines

Franklin Valveless Spells "Enonomy"



FRANKLIN GAS DRILLING ENGINE

These engines can show you a power, speed and flexibility almost unbelievable. Sizes for Western Service, $1725.00 and $2150.00. For Eastern Service $1450.00 and $1725.00. Prices F.O.B. Factory.

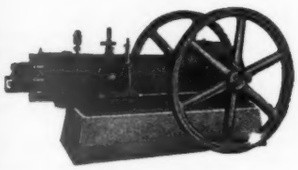


FRANKLIN OIL DRILLING ENGINE

A single cylinder oil engine which will give minimum operating cost, better performance under all conditions, and reduce drilling time.

Gives a perfect drilling motion and eliminates "fighting" the engine at any point from top hole to oil. Easy to start in all weathers. Bath lubrication.

The Franklin is a single-cylinder, three-port, two cycle VALVELESS engine. This is Type AO for Mid-Continent or Western Cable Tool Drilling. Price $3700.00. For Eastern Service $2600.00 and $3350 00. Prices F.O.B. Factory. Complete with self-oiling, reversible drilling clutch, circulating pump and fuel tank.



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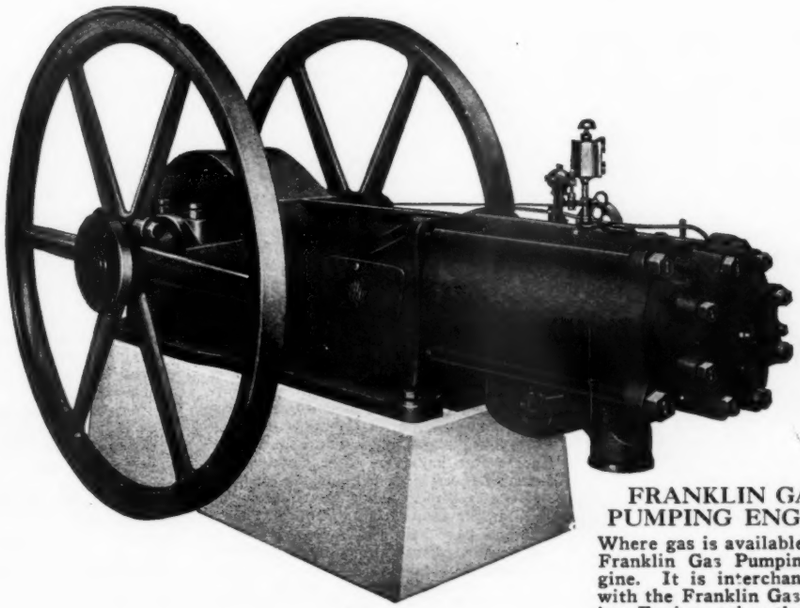

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Oil Fields

Use of Siphons for Handling Water

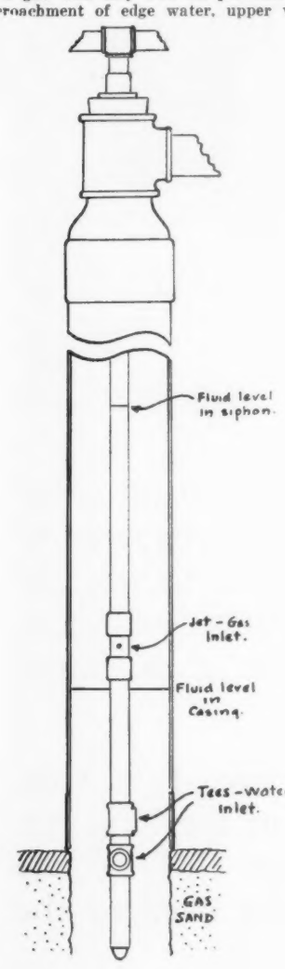
Installation and Method of Operation in Gas Wells. Size, Number and Spacing of Jets

By C. P. Parsons
Superintendent, Cement Oil Field and Chickasha Gas Field, Magnolia Petroleum Co.

Salt water is a common associate of natural gas and a cause of many special and expensive problems to operators while drilling and in later maintenance of gas wells.

Water encountered during drilling may be classified as either upper water, coming from formations above the gas sand, or bottom water, coming from the bottom of gas sand. In the case of series drilling, a practice not totally sound but done, where several gas sands are drilled and produce in one well there is the additional hazard of intermediate water.

Water that shows up after completion of a gas well may owe its presence to encroachment of edge water, upper water breaking in around casing shoe, or through collapsed or leaky casing.



SIPHON WITH SINGLE JET.

Upper water hazard has been practically eliminated by the present two-plug method of cementing and the present generally good quality of portland cement. The two-plug method follows the movement of the cement down the hole with a measuring line and accurately places the cement in its proper place behind the casing. By this method the gas string can easily be cemented outside from top to bottom, if desired.

Abundant use of cement is especially desirable in a gas field where rotary equipment is used for drilling. Rotary sets a short string of surface casing and usually goes clear to the gas sand before setting another, hence the latter casing serves dually as water string and gas string, withstanding the outer pressure of the upper water, thus keeping the water from the gas and withstanding the inner pressure of the gas. Abundant use of cement also helps the casing to withstand corrosion and galvanic action of upper waters, which might later weaken the casing and allow either upper water to come inside the casing or the gas to blow out or migrate outside.

Test Each Job

It is sound practice and pays in the long run to test each cementing job before drilling in the gas sand by drilling the cementing plugs, bailing the drilling mud and allowing the well to set for several hours to let the upper water have a chance to find its way down to and break around the casing shoe if the cement has channeled or if there is a water sand very close above the casing shoe or any other reason which might have adversely affected the setting of the cement.

The use of reliable cement accelerators which hasten the setting time of cement also have played a part in reducing upper water hazards. After casing is cemented there is an urge among operators or contractors to reduce the shutdown period while cement is setting. The accelerators have afforded increased strength of cement when drilling is resumed after a short shutdown.

In any case of water coming into a gas well from any cause it is desirable, where possible, to attempt a shut off. By plugging back in the case of bottom water with cement or lead wool. By recementing in the case of upper water coming around casing shoe or a new smaller string of casing cemented inside a collapsed original gas string.

Water conditions and shutting off methods have been discussed and written about authoritatively and profusely.

The purpose of this article is to consider up-to-date methods for handling cases where a shut off attempt is impractical and it is desired to try to handle the water along with the gas.

Early methods of cleaning water from gas wells was to just periodically blow them wide open before the water built up to a sufficient head to kill the effective gas pressure. That not only was a waste of gas but such blowing of wells allows "coning" up of water in a sand and hastens premature drowning.

When gas wells were not too large an anchor packer was sometimes run on tubing which, account of the small diameter of the tubing, would not allow much of a volume of water to build up in the well and account of increased velocity of the gas through the smaller diameter, and less breaking through, the well could be more effectively cleaned and would last longer.

A later method was to run 2-inch tubing equipped with "ejectors" or a series of jets placed advantageously at different levels up the hole. They were effective and the forerunner of the present siphon and jet method but even with a most efficient installation of ejectors some wells would drown that would have been kept alive longer with an efficient siphon installation. Then there is considerable difference between the cost of 1 inch pipe and 2-inch tubing. Also in gas fields where usually there are no derricks left standing over the wells the 1-inch can more efficiently, easily and safely be handled with a gin pole or pulling machine than 2-inch. One-inch weighs 1.68 pounds per foot while 2-inch weighs 4½ pounds.

Siphons

The name siphon as used in gas fields is not based on any scientific principle but has just been adopted into common usage to mean a string of small diameter pipe or tubing, usually 1-inch or three-quarters-inch, run in a gas well for the purpose of removing water. Sometimes it is called a bleeder.

Specifications of the pipe usually used for siphons are:

All pipe to be threaded extra long and fitted with long collars.

Size	Wt. per ft.	Internal Diam.	Test Press.
Standard black, buttweld			
¾"	1 13 lbs.	.824"	700 lbs
Extra strong			
¾"	1.47 lbs.	.742"	*700 lbs
Double extra strong			
¾"	2 44 lbs.	.434"	*700 lbs
Standard black			
1 "	1 68 lbs.	1.049"	700 lbs
Extra strong			
1 "	2 17 lbs.	.957"	*700 lbs
Double extra strong			
1 "	3 66 lbs.	.599"	*700 lbs

*Pipe jarred with hammer while under test pressure.

(Above sizes taken from Tubular Blue Book—National Tube Co. Their specifications for standard black pipe tally as to size and weight with the new A.P.I. specifications. Extra strong and double extra strong are not at present covered by A.P.I. specifications.)

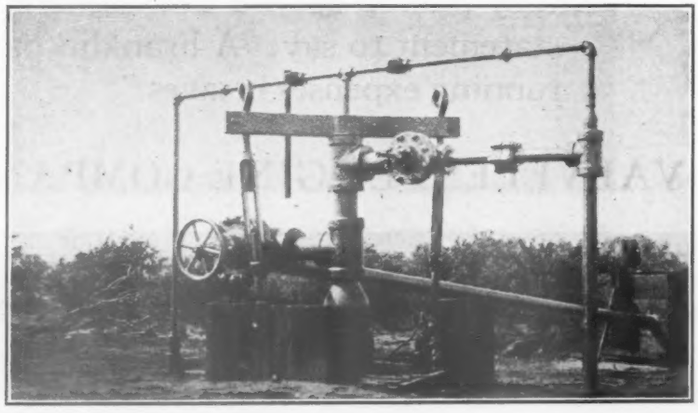
Standard test pressures for buttweld pipe are not figured by formula, due to the weld, hence the lack of tables showing collapsing pressures and safety factors, so it is left to experience and the individual to decide. For a fair measure of safety in hadling and for withstanding pressure strains standard black pipe is recommended here for gas wells down to 2,500 feet; extra strong in wells 2,500-3,500 feet, and double extra strong for wells below 3,500 feet.

Plain Siphons

Installations of plain siphons are strings of 1-inch or three-quarters-inch pipe without jets but with perforations or tees for water and gas entrance near the bottom. The bottom of tubing is plugged to prevent heavy mud or cavings from entering. The master gate is taken from the gas well and the casing is swedged down to 4 inches and a high-pressure 4-inch tee screwed on. Into the top of this is screwed a stuffing box when siphon is "landed" or set down. One form of stuffing box is made from an extra heavy 4-inch cast iron plug about 3 inches long with a hole cut through the center just large enough for the siphon pipe to go through. In the top part of this hole about three-quarters of an inch deep a larger hole or recess is drilled a little larger than the outside diameter of a siphon collar. By putting some packing in the bottom of the recess and around the siphon the top collar of the siphon sets on the packing and makes a gas shut off. A stuffing box rubber used in oil well pumping cut down to fit the recess makes good packing.

Such installations require practically no computation and rely on the gas well's pressure and volume being sufficient to start and flow the water. They are all right as early installations in gas wells that have high shut-in pressures and are just moist, requiring infrequent blowing. In wet wells that require constant blowing but with small delivery there is wastage of gas. To prevent gas wastage in blowing and where delivery is sufficient and fairly continuous both the gas for delivery and water is taken together through the siphon and separated in a drip or trap between the well head and delivery meter.

There also are wells that are wet enough to drown completely even with the plain siphon working at maximum efficiency. Even when such a well may not have very much value itself there are times when it is necessary to keep it commercially alive in order to retain the lease until such time as another well can be conveniently drilled or for other prospects. There is value there and that value can be retained by almost no additional expense over the plain siphon—just one or more little holes or "jets" drilled in some nipples and some concentrated computation as to the size, number and spacing of jets.



Siphon connections—showing combination surface connections that allow blowing of well through casing or siphon, taking of delivery through casing or along with water through siphon, putting extraneous pressure on siphon and "rocking."

Basis for Practical Installations

Exclusive of the jets this form of siphon is installed the same as a plain siphon; that is, the same size pipe and with the same perforations or tees near the bottom for the entrance of the water and with the bottom plugged to keep out heavy mud or cavings.

It is quite impossible to get entirely away from scientific computation in problems concerning the efficient use of energy from expanding gas to perform certain subsurface work. Particularly when the gas used is necessarily just a small portion of the total amount of gas available. The smaller the portion of gas used the better, as it keeps the shut-in pressure

(Continued on Page 122)

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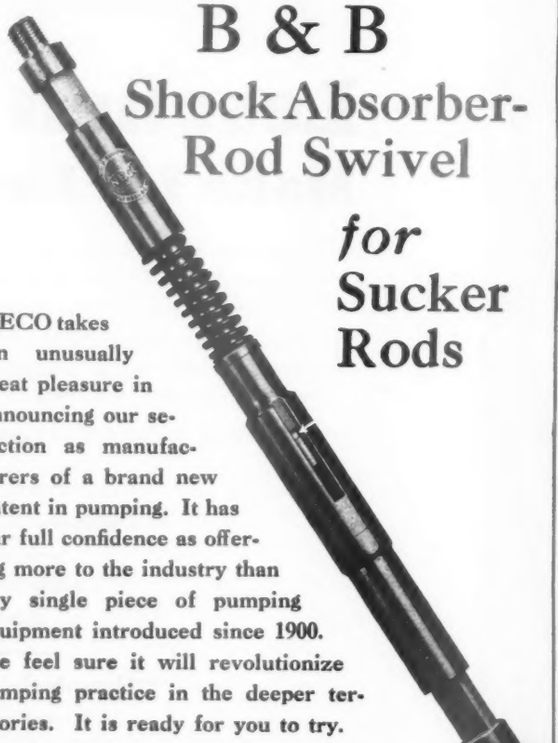

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The Pumping Equipment You Will Eventually Use

Flow of Gases Through Small Orifices

Bureau of Mines Completes Careful Study of Various Conditions of Flow Under High and Low Differential Pressures

By E. L. Rawlins*
Associate Natural Gas Engineer, United States Bureau of Mines

During recent years small orifices have been found to be applicable to important operations in the natural gas industry. They are especially applicable for control purposes. Large quantities of gas can be forced through them under high differential pressure, and as a result they have been used under these conditions for high pressure measurement of air flow, and some experimental work by different investigators has been done to determine coefficients that should be used to secure correct measurement. These experiments for practical application, however, have been limited to the flow from some high pressure to the atmosphere.

When the flow is such that the differential pressure is large, the use of small orifices has been applied advantageously to gas well operation. The flow from a gas well can be regulated to a desired amount by using orifices of the proper size. The orifices can also be used in other control work where high pressures are found.

The use of small orifices is an outgrowth of the orifice meter as used in the natural gas industry. The application of orifice meters to measuring gas volumes has developed rapidly since their introduction to the natural gas industry in 1904. Their use has been studied carefully and improvements made in their construction and application until the orifice meter is now the generally accepted basis of measuring natural gas at high pressures. The orifices used with the orifice meter in general practice vary from a minimum of one-half inch to several inches in diameter, depending upon the quantity of gas to be measured, as compared to diameters from one-thirty-second to one-fourth inch for the small orifices described in this report. The meter operates under comparatively low differential pressures, the maximum differential pressure across the orifice being equivalent to about 100 inches of water. The ratio between the downstream pressure and the upstream pressure therefore approaches unity For the range of static pressures ordinarily used in commercial operation, the ratio between the downstream pressure and the upstream pressure varies from about 0.85 to almost 1 00.

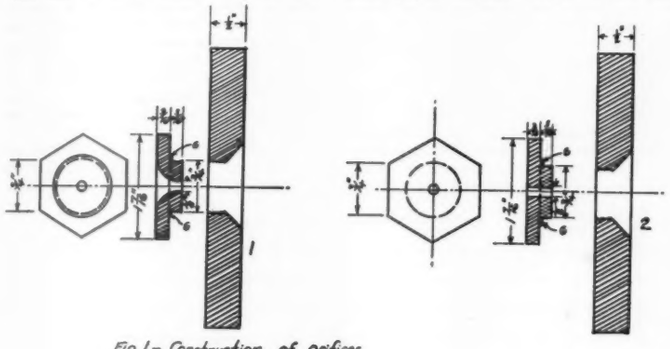

Fig. 1 – Construction of orifices.
1. Trumpet orifice.
2. Straight orifice.
G. Gasket.

Scope of Report

Recognizing the value of the principles involved relative to gas well operation, the Bureau of Mines has made a careful study of the various conditions of flow through small orifices under high differential pressures. Data also have been obtained for low differential pressures. All of the conditions of flow are described in this report, and the results of experimental tests are given, together with the coefficients that were obtained.

Stress is laid, however, on the fact that the coefficients and results as given in the report apply strictly only to the construction and nature of the orifices which were used to secure them. The experiments have shown clearly that the effect of roughness of edges, improper bore, variations in thicknesses, and other similar factors are more pronounced than has been suspected for flow through small orifices. It is recognized that for definite operating conditions where accurate results are required the particular orifice used should be calibrated experimentally.

If the investigative work should be continued, approximate coefficients doubtless could be obtained for any condition of flow with any desirable construction of orifice.

Acknowledgements

This paper is a summary of the important information contained in a Technical paper entitled "Flow of Air and Natural Gas Through Small Orifices Under High Differential Pessures" by R. A. Cattell and E. L. Rawlins, which is now in the process of publication.

The Natural Gas Association of America co-operated in planning the work, making the actual field experimental tests, and offered suggestions through its committees in the interpretation of results.

The splendid co-operation and willing assistance given by the operating companies and the representatives of these companies in the field furnishing equipment and assisting in making the experimental tests are gratefully acknowledged. Special acknowledgment is made to the Empire Gas & Fuel Co. and to the Indian Territory Illuminating Oil Co., that furnished equipment and facilities for conducting the experimental tests.

The State of Oklahoma also co-operated in making the investigation

Conditions of Flow Through Orifices

A detailed mathematical discussion can be given of the flow of gases through orifices, assuming the flow to be adiabatic and frictionless. However, in this paper only a summary of the important facts obtained by such an analysis will be presented. Briefly stated, the factors that influence the rate of flow of gas through orifices are the size and shape of the orifices, the upstream and downstream pressures, the upstream temperature, and the characteristics of the gas, including the ratio of specific heats, the gravity, and the viscosity. These factors determine the velocity of the flowing gas, the density of the flowing gas, and the cross sectional area of the stream of flowing gas. These latter in turn determine the rate of flow through the orifice in pounds per second. This quantity can be reduced to the quantity in cubic feet per second at any defined pressure base.

In general, there are two separate and distinct conditions of flow through an orifice. For low differential pressures, or where the downstream pressure is almost equivalent to the upstream pressure, the quantity of gas flowing through the orifice depends upon both the upstream and downstream pressures. Under these conditions a change in either the upstream or downstream pressure will change the rate of flow of the gas. As the differential pressure is increased and the ratio between the downstream and upstream pressure is decreased from unity to lower values, the velocity of the gas is increased until it reaches a maximum equal to the acoustic velocity (velocity of sound) in the gas, after which it does not change. This ratio of pressures at which the velocity becomes "critical" or reaches a maximum is defined as the "critical ratio of pressures."

Rate of Flow

For high differential pressures, or where the pressure on the upstream side of the orifice is large compared to the pressure on the downstream side, the rate of flow (in pounds or standard cubic feet per second) through the orifice is directly proportional to the upstream pressure. This is true because, as explained above, the velocity of the gas (in feet per second) through the orifice under critical flow is maximum and cannot increase, regardless of how much the upstream pressure is increased. A greater upstream pressure, therefore, does not increase the velocity, but does increase the density of the gas.

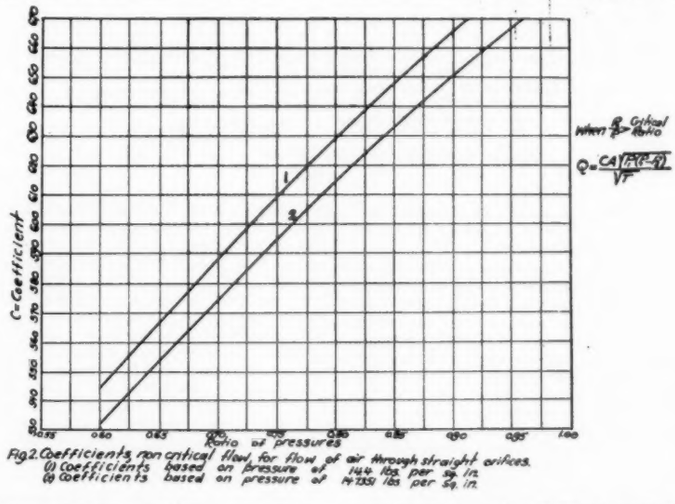

Fig. 2 Coefficients non critical flow for flow of air through straight orifices.
(1) Coefficients based on pressure of 14.4 lbs. per sq. in.
(2) Coefficients based on pressure of 14.7 lbs. per sq. in.

The density change is proportional to the change in upstream pressure and is the sole factor, under critical flow, that determines the rate of flow through a particular orifice.

The critical ratio of pressures for the flow of air through an orifice, assuming adiabatic and frictionless flow and no deviation from the laws of a perfect gas, is given by the equation

$$\frac{P_2}{P_1} = 0.528$$

where P_2 is the downstream pressure and P_1 is the upstream pressure. If the assumptions were true, the quantity of air flowing through the orifice would be directly proportional to the upstream pressure P_1 and independent of the downstream pressure P_2 when the ratio between the downstream and upstream pressure is less than 0.528 If the ratio of pressures is greater than 0.528, the quantity of gas flowing through the orifice depends upon both the upstream and downstream pressures; and both pressures have to be used in the formula to calculate the flow.

Three Combinations

Three combinations of relations between upstream and downstream pressures for the flow of gas through orifices are found in practice. They are:

1. Flow through an orifice from a series of different upstream pressures into a constant downstream pressure.
2. Flow through an orifice from a constant upstream pressure into a series of different downstream pressures.
3. Flow through an orifice from any of a series of different upstream pressures into any of a series of different downstream pressures.

In each of the three cases, the problem is the same except that it is considered from a different point of view. The question to be determined in selecting the formula to be used for any one computation is whether the flow is critical or non-critical. One formula is applicable to critical flow and an entirely different one is applicable when the flow is non-critical.

Experimental Tests

Experiments were conducted with both air and natural gas to determine the quantity flowing through orifices of known size and shape and under known flowing conditions. The values that define the critical ratios of pressure were determined experimentally, and coefficients were derived from the experimental results which can be used in the formula to calculate the quantity of gas flowing through an orifice if the size and shape of orifice, the characteristics of the gas, and various flowing conditions are known. Separate investigations were made with the two following combinations of pressure relations: First, flow from a series of different upstream pressures into a constant downstream pressure; and second, flow from a constant upstream pressure into a series of different downstream pressures.

The rates of flow of air and natural gas through orifices at different pressures for flow from a series of different upstream pressures into a constant downstream pressure were obtained by discharging from a reservoir constructed of four joints of 18-inch casing into the

*Before Southwestern Short Meter Course at Norman, Okla., April, 1928.

atmosphere. The reservoir was filled with air or natural gas at high pressure, and the rate of pressure drop was measured as the air or natural gas was discharged from the reservoir through an orifice into the atmosphere. The pressures were taken with a deadweight gauge, constructed from a deadweight gauge tester. The temperature of the gas in the reservoir and the temperature of the gas just before it flowed through the orifice also were obtained. From the known volume of the reservoir (which was calibrated with water), the rate of pressure drop, and the temperature of the gas, it was possible to calculate the rate of flow through any particular orifice under known pressure conditions. A series of tests then were made for the flow from a series of different upstream pressure into constant downstream pressure, where the quantity of gas was measured with a specially constructed and calibrated funnel meter.

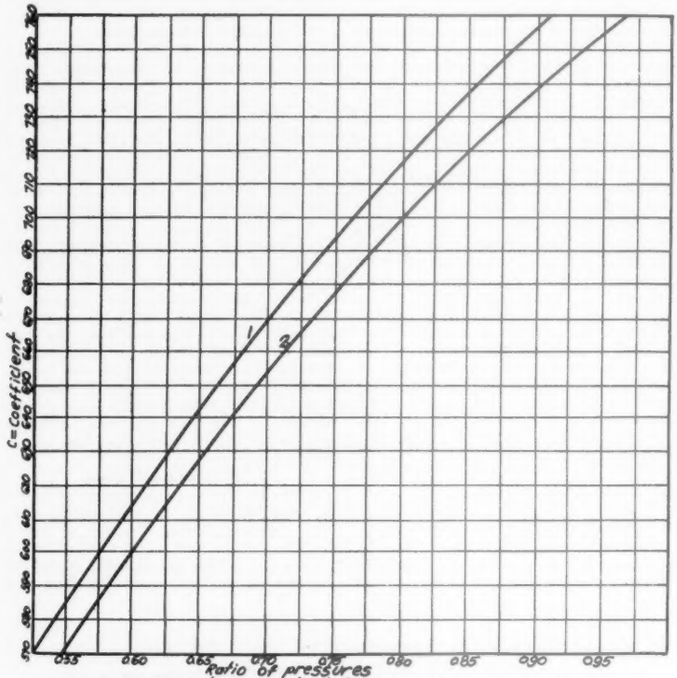

Fig. 3 - Coefficients, non critical flow for flow of air through trumpet orifices into atmosphere.
(1) - Coefficients based on 14.4 lbs per sq. in.
(2) - Coefficients based on 14.7351 lbs per sq. in.
When $P_2/P_1 >$ Critical Ratio, $Q = \frac{CA\sqrt{P_1(P_1-P_2)}}{\sqrt{GT}}$

The rates of flow from a constant upstream pressure into a series of different downstream pressures were obtained by discharging gas through a regulating manifold where a constant upstream pressure was maintained, then through the orifice, then through a downstream regulating valve, where any desired downstream pressure was maintained, and finally through a specially constructed and calibrated funnel meter, where the rate of flow was measured. Pressures, both upstream and downstream on the orifice, were obtained with deadweight gauges. Also the upstream and downstream temperatures of the flowing gas were observed. From the data obtained on the funnel meter and the other data that were taken, it was possible to calculate the rates of flow through any particular orifice under known pressure conditions.

The rates at which air or natural gas flowed at various pressures were measured through both straight and trumpet orifices. The diameter of the orifices varied from one-sixty-fourth to one-eighth inch. The orifices were drilled and machined in small brass disks. These disks, in turn, were threaded and screwed into a steel plate 4 inches in diameter, a small copper gasket (G) between the orifice disk and steel plate preventing any leakage. The drawings in Figure 1 illustrate the construction and dimensions of the straight and trumpet orifices and the steel plate that were used.

Method of Analyzing Data

As explained previously, calculations were made to find the rates of flow of both air and natural gas through the various orifices under different conditions of pressure. Curves then were drawn with the rates of flow as ordinates and the corresponding pressures and pressure ratios as abscissas. These curves showed definitely the relation between the rate of flow, and either upstream pressure or pressure ratio for the two types of orifices (straight-edged and rounded approaches) and also established the relations for flow through different sizes of orifices.

One object of the experimental work on flow of gas through orifices was to obtain coefficients which could be used in field operation to design proper installations and to calculate the rate of flow under any pressure conditions of operations. The tests cover a wide range of operating conditions. Tests were made for flow from a series of different upstream pressures into a constant downstream pressure and also from a constant upstream pressure into a series of different downstream pressures. Also, the entire range of pressure ratios from 0.027 to unity was used. These data were obtained for flow conditions on both sides of the "critical ratio."

In studying the data each condition was considered separately. First, coefficients were obtained for the flow of air, both when the pressure ratio was higher than the "critical" value and when it was less than this value. This was done for each size and shape of orifice. The results of the tests then were combined and a general coefficient was derived which was used in the formula to calculate the rate of flow in terms of the area of the orifice and the pressure conditions. There were, of course, separate coefficients for flow above and below the "critical ratio."

This procedure was used for the flow of natural gas from the reservoir from a series of different upstream pressures into a practically constant downstream pressure when flow was calculated by pressure drop; for the flow of gas from a series of different upstream pressures into a constant downstream pressure when the gas volume was measured with the calibrated funnel meter; and for the flow of gas from a constant upstream into a series of different downstream pressures when the flow was measured with the funnel meter.

Finally, the entire set of data was combined and two general sets of coefficients were derived: First, for pressure ratios when the flow is "critical" or when the ratio of downstream to upstream pressure is less than the critical ratio; and second, for pressure ratios when the flow is not "critical," or when the ratio of downstream to upstream pressure is greater than the critical ratio of pressures.

The value of the coefficients and the formulae which were used to calculate them are given in the summary of results later in the paper.

Physical Properties Affecting Flow

The physical conditions and properties that affect the flow of natural gas through small orifices are specific gravity, temperature, deviation from Boyle's law, and ratio of specific heats. A brief discussion of these properties as applied to this investigation is given below.

Gravity

The rate of flow of natural gas through an orifice is inversely proportional to the square root of the gravity. The natural gases used in the experimental work described in this paper varied from 0.60 to 0.85, and when the results were converted to a common gravity basis by the proportional relation they were comparable.

Temperature

The rate of flow of natural gas through small orifices is considered to be approximately inversely proportional to the square root of the absolute temperature.

In the tests of flow of gas from a series of different upstream pressures into a constant downstream pressure as previously described it was necessary to observe the temperature of the flowing gas before it flowed through the orifice. The rate of flow then was corrected to a base of 60 degrees Fahrenheit by the proportional relation. After this correction was made the results of the tests of the different orifices were comparable. However, there were no exceptionally high temperatures during these tests.

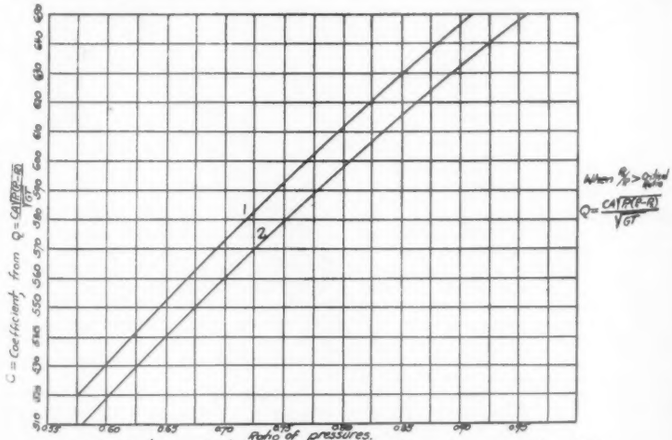

Fig. 4. Coefficients, Non-critical flow for flow of natural gas through straight orifices
(1) Coefficients based on pressure of 14.4 lbs per sq. in.
(2) Coefficients based on pressure of 14.7351 lbs per sq. in.

Several separate sets of experiments were conducted with the orifices to determine the effect of a large temperature change upon the rate of flow through the orifice. Tests were conducted with both the one-sixteenth inch trumpet and one-sixteenth inch straight orifice, and both air and gas were discharged through the orifice in separate tests. The results showed that the average value of the factor, Q/P (where Q is the rate of flow and P the upstream absolute pressure) for the flow at an average temperature of 48 degrees Fahrenheit was 0.4672. For the flow at high temperatures (110 to 115 degrees) the value of Q/P was 0.4741. In other words, there was a difference of approximately 1½ per cent between the results of the tests after the rate of flow was corrected to a standard flowing temperature of 60 degrees Fahrenheit. In all of the experimental tests, where the temperature correction was large, there was a difference of from 1 to 2½ per cent between the results when the rate of flow was measured at a high temperature and corrected to a 60-degree Fahrenheit base by the use of the temperature relation and when the rate of flow was actually measured at a temperature of approximately 60 degrees Fahrenheit. This apparent discrepancy was due to a combination of a probable experimental error, a possible expansion of the orifice due to higher temperature, and the possibility that the observed temperature of the flowing gas was higher than the actual temperature at the entrance of the orifice.

Deviation From Boyle's Law

When gas is measured at high pressures and the quantity is calculated to a low pressure basis, it is ordinarily assumed that the gas is a perfect gas and that Boyle's law, which states that at a constant temperature the volume varies inversely with the absolute pressure, is strictly applicable. In other words, it is assumed that the $\frac{PV}{T}$ is constant throughout a range of pressures. This assumption is not true for natural gas. As explained before, for natural gas $\frac{PV}{T}$ decreases as the pressure increases. Therefore, for the flow of natural gas through orifices, more gas will flow through the orifices at high pressures than would be indicated by the use of Boyle's law.

The coefficients as derived in this report are based upon the assumption that the gas complies with Boyle's law. It was necessary, therefore, to consider the effect of deviation in calculating the results of the experimental tests so that the coefficients could be expressed on this basis.

If it is desired to correct the C in the formula for compressibility effect, the quantity as obtained assuming no deviation should be multiplied by the factor

$$\sqrt{1+d}$$

where d represents the per cent deviation at the particular flow condition. For instance, if d is 10 per cent, the correction factor is

$$\sqrt{1+10} = \sqrt{1.10}$$

Ratio of Specific Heats

One of the physical properties of natural gas that affects the rate of flow through an orifice and which is not included in the empirical formulas used in this report is the ratio of specific heats.

This factor is designated as k and is defined as the ratio of specific heats at constant pressure to that at constant volume.[3]

For air, the value of k is approximately

(Continued on Page 125)

[3] Specific heat of air at constant pressure = 0.241 B.t.u. per pound per degree Fahrenheit and at constant volume = 0.172 B.t.u. per pound per degree Fahrenheit. Therefore k for air $= \frac{0.241}{0.172} = 1.40$ (Emswiler, "Thermodynamics," p 97.)

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Pipe Line Corrosion and Protection

Proper Method of Applying Coatings Most Important Factor. Character of Soils Should Be Studied Carefully

By W. G. Ha-n*
The East Ohio Gas Co., Cleveland, Ohio

One of the chief concerns of all companies owning underground pipe line systems is the problem of pipe corrosion and the proper methods of effectually protecting steel pipe from unfavorable soil conditions. The importance of this matter is at once apparent when due consideration is given to the enormous investment in gas mains and services, some of which are constructed under expensive pavements, making the cost of repairs and replacements to them almost prohibitive.

Considerable work has been performed by various agencies on the study of soils in various cities to determine, if possible, the relative effect of the different soils on underground piping. The United States Bureau of Standards has been particularly active in this work, and has issued several valuable papers on the subject.

Studies of this kind are very important, and while a company operating in the northern part of the country may not be vitally interested in the soil corrosion problems of companies operating in the southern part, the information contained in these reports furnishes a basis for any particular company to make a study of the different soils encountered in the territory in which it is operating so that an estimate at least can be made of the life of gas mains and services which are in use at the present, or may be constructed there at some future time.

It is true that some very conflicting reports are obtained at times by companies making studies of this kind. These, however, are the exception. The value of accurate information in the form of permanent records showing the nature of the various soils with reference to their tendency to promote corrosion cannot be overestimated.

Soils in One Area Differ

It is quite a common occurrence to find soils of widely different corrosive characteristics in the same city. The identical soil in any location is very likely to give a varying corrosive charactertistic with varying drainage conditions. Soils which have little or no corrosive action on underground piping in dry territory often promote corrosion very materially in wet, marshy territory. It must be understood, however, that the chemical content of the soil itself is not always the dominating factor in occurrences of this kind, but rather the conditions which are set up by the wet soil which aids other agencies, such as corrosive ground water. Accurate information concerning the character of the soil in all parts of territory through which the underground piping system is to be constructed or in which an existing system is being maintained is worth many times the cost of obtaining this information.

Obviously, it is just as uneconomical to expend money on pipe protecting materials in treating pipe which is being laid in soils which are noncorrosive as it is to lay uncoated pipe in soils which are corrosive. The main difference in these two cases, of course, is that in coating pipe which needs no protection the error is rarely uncovered; while in the case of not coating a pipe line which should have been protected and which requires premature repairs or replacement, this fact is often brought to the attention of city officials and the public by the breaking of pavement in important thoroughfares. Of the two evils, there is little question in the minds of thinking operators which course should be pursued.

Some companies have been using elaborate systems of inspecting mains and services for years, and have very complete records of these inspections and the condition of their property. In a few cases this information has been used to compile tables by the aid of which the engineer is able to make an estimate of the probable condition of the mains and services in any location.

The corrosion of steel pipe is generally conceded to be an electro-chemical process which can be greatly retarded by a study of the existing conditions and the application of one or another of the recognized methods of preserving the pipe. A brief outline of what occurs during the process of corrosion might not be amiss Steel pipe which has been exposed to the air is enclosed in an invisible film of condensed moisture, and has a tendency to lose electrons and to go into solution. If the pipe is made of homogeneous metal and if air is absent the action ceases as soon as a small quantity of metal has dissolved. The process of corrosion continues, however, in the presence of air and the intensity of the action depends largely on the amount of air and moisture which is present. If the metal is not homogeneous, and free from mechanical strains, or if it has an imperfect surface with the presence of mill scale, an electrolytic action is obtained which promotes corrosion.

What influence the quality of the metal, of which standard steel pipe is rolled, has on its corrosive resisting qualities is a question which seems to be of less importance than how the pipe is rolled, and the quality of its surface finish. Mi'l scale is electronegative to iron and tends to hasten the process of corrosion very materially. A smooth, clean surface, free from marks of any kind, is highly desirable. Pipe manufacturers seem to have more trouble in producing a clean, smooth surface on large pipe than on the smaller sizes. Marks of one kind or another which appear on new pipe direct from the mill are often mistaken later for pits or attributed to electrolysis.

Several grades of alloy steel pipe have been placed on the market recently which seem to resist ordinary soil corrosion in a satisfactory manner. The additional cost of these materials is such as to preclude their use except in special cases. They are also in competition with coated steel pipe and at present seem to be somewhat more expensive.

Protecting Steel Pipe

There have been few new developments in the materials which are commonly used in the protection of steel pipe from soil corrosion during the past few years. Considerable data have been gathered and issued to the public on the various characteristics of these materials and recommendations made as to the proper specifications to be used in ordering these materials and preparing them for application to the pipe. In order to bring these matters up for discussion a brief description of the common methods of protecting steel pipe will be repeated here.

The popular methods of protecting steel pipe in vogue at the present time will be divided into three groups, which comprise all painted or dipped coatings in the first group, coatings reinforced with a wrapping in the second group, and molded materials in the third group. Before applying any kind of a coating to steel pipe the pipe must be perfectly clean, and free from mill scale, grease and rust. It is highly desirable in some cases, and absolutely essential in other cases, that the pipe be perfectly dry.

Oil paints commonly used for preserving steel structures exposed to the air are not generally recognized as being suitable coatings for underground pipe systems for the reason that they become soft and porous in a comparatively short time and as a general rule offer little protection.

Melted asphaltum with a melting point of about 160 degrees Fahrenheit, when properly applied to perfectly clean pipe under suitable weather conditions, often gives results which are satisfactory. For effective protection these coatings should be over one-sixteenth of an inch thick, should adhere tightly to the pipe and should not be brittle when cold, nor sticky when exposed to the sun. There are many modified forms of asphaltum base paints on the market, some of which seem to give satisfactory results to the companies using them. Some users of steel pipe prefer the hot dipped coating for the reason that the pipe may be preheated before dipping. This method insures a coating of proper thickness on dry pipe.

The wrapped pipe coating was designed to protect pipe from corrosion in soils which prematurely destroy the protection afforded by the painted or dipped coatings, and as an aid in protecting the coating in transit. In this process the pipe is thoroughly cleaned, then heated and transferred to the coating and wrapping machine. The object of heating the pipe is to drive off all moisture and to prevent the asphaltum from chilling when coming in contact with the pipe. The pipe is then thoroughly coated with asphalt heated to a temperature of about 350 degrees Fahrenheit. The wrapping material, which is usually thin sheeting or burlap, is then wrapped spirally around the pipe which causes the hot asphaltum to soak through the wrapping material. Additional asphaltum is applied to the wrapped pipe so that the fabric is completely enclosed. The pipe is then removed to the drying rack. A priming coat of thinned asphaltum or coal tar is often aplied to the pipe before it enters the wrapping machine, to assist in attaining a proper bond.

Some companies wrap their pipe by machinery designed especially for this purpose while other companies revolve the pipe by machine and guide the fabric on to the pipe by hand. Good results are being obtained by both methods. It will be readily seen that any desired thickness of coating can be obtained by applying layers of fabric and asphaltum, although two ply of fabric is usually sufficient. Pipe manufacturers furnish a satisfactory wrapped pipe coating but on account of the difficulty of handling and transporting it without injury, they have not generally recommended that the pipe be coated at the mill.

Molded Coatings

Included under the classification of molded coatings is the use of materials such as clean, non-corrosive back-filling soil, lime and clean sand mixed with lime. The method is often satisfactory for use in constructing or replacing a line through filled ground in locations where good back-filling sand is obtainable and where the excavated material can be economically removed. This meth-

(Continued on Page 152)

*Before Natural Gas Department, American Gas Association, Dallas, Tex.

ORIFICE METER MEASUREMENTS, INSTRUCTIONS, SPECIFICATIONS

By John C. Diehl*
Metric Metal Works

Orifice meter measurement involves: first, the layout which consists of an orifice for producing the differential, a section of pipe line on each side of the orifice, a device for recording the differential and line pressure, connections from the line to the differential gauge; second, calculations of the rate of flow and volume from the records according to formula and certain coefficients or constants.

Instructions and specifications for the orifice meter settings are contained in the preliminary report of the gas measurement committee of the Natural Gas Association of America. This report was prepared after an extensive series of tests which covered several months. These instructions may be summarized as follows:

The diameter of the orifice should not be greater than six-tenths of the inside diameter of the pipe, and if a large orifice is required, the pipe and flange should be enlarged so that the diameter ratio will not exceed six-tenths.

If within 100 pipe diameters upstream from the orifice plate the run of pipe includes anything other than flanges, collars, wide open gates, or bends, elbows, or tees which are all in the same plane, then a set of straightening vanes should be placed in the pipe between the upstream pressure tap and the nearest such interruption, but not less than six pipe diameters away from the pressure tap.

If within 200 pipe diameters upstream from the orifice plate, there is a regulating valve, regulator, differential valve check valve, or similar flow-disturbing apparatus or fittings, vanes should be used.

The straight run upstream from the pressure tap to the nearest fitting or turn should not be less than 10 pipe diameters, and the straight run downstream, measuring from the downstream pressure tap, should not be less than five diameters.

A pressure regulator, differential valve or check valve should not be placed downstream from the orifice plate closer than ten diameters to the downstream pressure tap.

Proper Dimensions

1. The greatest dimension of the inside cross-section of any of the passages through the vanes should not be more than one quarter of the inside diameter of the pipe line.

2. The length of the vanes should not be less than 10 times the greatest transverse dimension mentioned.

The purpose of the vanes is to eliminate whirl, crosscurrents, and large eddies, and make the gas flow straight along the pipe.

The vanes may be built of standard weight pipe, or thin walled tubing, welded together and built into a nipple to be used as a section of the pipe line, or the vanes may be built in two end rings small enough to slip into the pipe line, being held firmly in place by set screws.

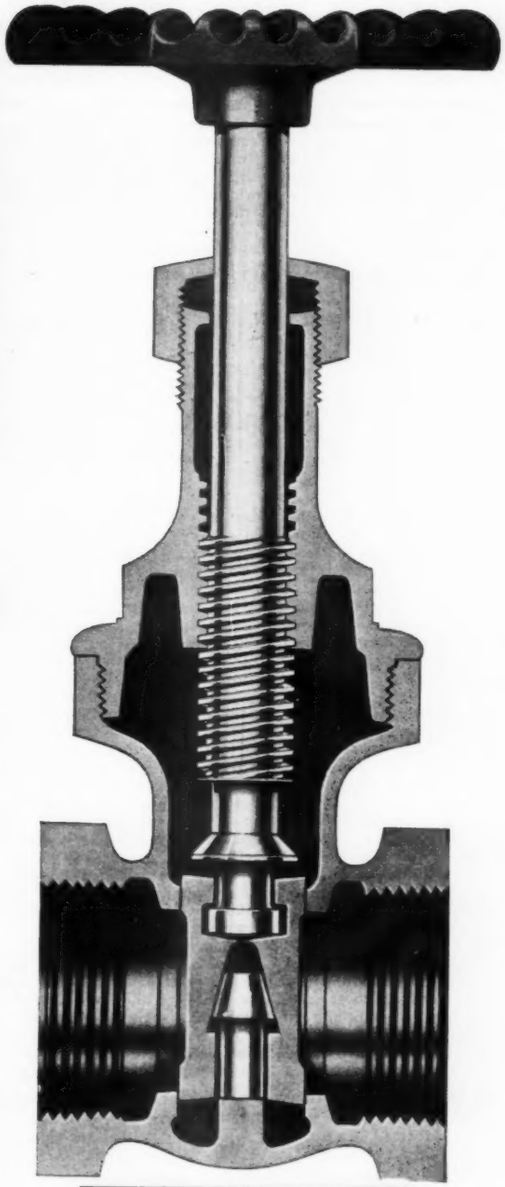
If thick walled tubing is used it would be well to have the ends cut back to a thin edge.

Square or hexagonal tubes can be used in making the vanes. It is not necessary that all the vane passages should

(Continued on Page 151)

*Before Fifth Annual Gas Meter Short Course, University of Oklahoma, Norman, April, 1928.

WALWORTH "KAY" BRASS Gate Valve



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More Common Commercial Gas Fuels

Chemical Principles Involved in the Preparation and Combustion Theory of Light. Manufacture of Coal Gas

By Lawrence H. Dalman
Department of Chemistry, New York University

It is to be expected that the composition and calorific values of natural gases will be found to vary within a considerable range in different sections of the country and frequently even in the same section. This is clearly illustrated in the following table, which contains the results of analyses taken from various sources within one particular gas field.

TYPICAL ANALYSES AND CALORIFIC VALUES OF NATURAL GAS FROM VARIOUS EASTERN WELLS

Locality of Well—	H	CH_4	CO	CO_2	N	O	Heavy Hydrocarbons	H_2S	B.t.u. per Cu. Ft. Calculated*
Anderson, Ind.	1.86	93.07	0.73	0.26	3.02	0.42	0.47	0.15	1.017
Marion, Ind.	1.20	93.16	0.60	0.30	3.43	0.55	0.15	0.20	1.009
Muncie, Ind.	2.35	92.87	0.45	0.25	3.53	0.35	0.25	0.15	1.004
Olean, N. Y.	...	96.50	0.50	...	....	2.00	1.00	...	1.018
Findlay, Ohio	1.64	93.35	0.41	0.25	3.41	0.39	0.35	0.20	1.011
St. Ive, Pa.	6.10	75.54	(†)	0.34	....	...	18.12	...	1.117
Cherry Tree, Pa.	22.50	60.27	...	2.28	7.32	0.83	6.80	....	842
Grapeville, Pa.	24.56	14.93	(†)	(†)	18.69	1.22	40.60	...	925
Pittsburgh, Pa.	26.16	65.25	0.80	0.60	....	0.80	6.30	...	899
Pittsburgh, Pa.	20.02	72.18	1.00	0.80	....	1.10	4.30	..	917
Pittsburgh, Pa.	9.64	57.85	1.00	...	23.41	2.10	6.00	...	748
Harvey Well, Butler Co., Pa.	13.50	80.00	(†)	0.66	....	...	5.72	....	998

*B.t.u. approximate. †Trace.

It will be seen from the table above that natural gas is not a complex mixture of different individual gases as is sometimes supposed. It is rather a mixture of very similar paraffin hydrocarbons, of the same general type, with carbon dioxide, nitrogen, etc., present in such small quantities as to be classed as impurities.

The table also shows that the hydrocarbon content remains fairly constant. Of the impurities, hydrogen and nitrogen undergo quite a wide variation. While the nitrogen may have been derived from the original plant material, it is assumed that the hydrogen results from high temperatures during carbonization as it does in the manufacture of commercial gas to be discussed later.

The effect of pressure on the rate and course of the reactions taking place during the formative period of natural gas has been duly noted. In the same manner, the pressure on a gas in its ultimate state is responsible for a considerable change in its composition, thus dividing natural gas into two classes: (1) the "dry" or ordinary gas, and (2) "wet" gas from which natural gasoline is produced. Analyses of three natural gases, showing the percentages of hydrocarbons present is given below:

ANALYSIS OF TYPICAL "DRY" AND "WET" NATURAL GASES PERCENTAGE IN TOTAL VOLUME

Quality of gas—	Methane	Ethane	Propane	Butane	Pentane, Hexane, etc.	Nitrogen	Carbon Dioxide
Dry	84.7	9.4	3.0	1.3	...	1.6	...
Dry	84.1	6.7	....	....	....	8.4	0.8
Wet	36.8	32.6	21.1	5.8	3.77	...	...

The table shows that the dry natural gases are composed mainly of methane and decreasing amounts of the succeeding hydrocarbons up to pentane. The wet gas, on the other hand, contains varying proportions of nine hydrocarbons. The physical characteristics of these nine hydrocarbons are shown in the following table.

PHYSICAL DATA OF THE HYDROCARBONS OF NATURAL GAS

Name and Chemical Formula—	Physical State	Specific Gravity Air=1 H_2O=1	Boiling Point Degrees F.	Critical Temperature Degrees F.	Critical Pressure Lbs. Sq. In.	Vapor Pressure Lbs. per Sq. In. at 80° F.
Methane, $C H_4$	Gas	0.5547	—265	—139.9	736.5	....
Ethane, C_2H_6	Gas	1.036	—119.2	95.0	665.8	....
Propane, C_3H_8	Gas	1.5204	—481	206.6	662.8	147.2
Butane, C_4H_{10}	Gas	2.0100	42.8	307.4	522.0	44.1
Pentane, C_5H_{12}	Liquid	.627	97.34	387.0	486.6	9.9
Hexane, C_6H_{14}	Liquid	.658	156.02	454.1	441.9	2.9
Heptane, C_7H_{16}	Liquid	.683	209.12	512.3	394.8	0.9
Octane, C_8H_{18}	Liquid	.702	258.08	565.5	371.2	....
Nonane, C_9H_{20}	Liquid	.718	301.1	....	....	....

Of the nine hydrocarbons forming natural gas, the first four are permanent gases at atmospheric temperature and pressure. The five remaining hydrocarbons are liquids and are the group which can be easily liquefied and form what is termed natural gas gasoline. The following distinction (although purely arbitrary) is made between dry and wet natural gas. If 1 gallon or more of natural gasoline can be extracted from 1,000 cubic feet of the natural gas by simple compression and cooling it is called "wet." Those natural gases containing little gasoline-making components and which require some other method for extraction, are said to be "dry."

Although the latter five hydrocarbons are liquids at ordinary conditions of temperature and pressure, they may be found to exist as gases in the total mixture to some extent, depending on their vapor tensions and the total pressure of the mixture.

The total pressure of any mixture of gases, according to Dalton's Law of Partial Pressures, is equal to the sum of the partial pressures exerted by each component as if it alone occupied the total volume. It follows then, that if the total pressure of the mixture is such that the partial pressure of any one component is exceeded then that particular component will be unable to exist in the state of a gas. For example, assume that a natural gas contains 2 per cent of pentane at 80 degrees Fahrenheit. The vapor pressure of pentane at 80 degrees Fahrenheit is 9.9 pounds per square inch as given in the table. The pressure, above which pentane cannot exist as a gas, is $(100 \div 2) \times 9.9$ or 495 pounds per square inch.

Thus, the natural gas emanating from a well at 80 atmospheres pressure will consist principally of methane and ethane. As gas is withdrawn and the pressure diminishes, some propane and butane will appear. As the pressure drops to atmospheric and further withdrawal of gas can only be obtained under diminished pressure, more and more of the hydrocarbons will be pumped off. These latter portions of gas thus contain a fair percentage of pentane, hexane, etc., which can easily be condensed to liquids by simple compression and chilling. These condensed hydrocarbons thus constitute the liquid fuel commonly called natural gasoline.

It can be seen, therefore, that no sharp line of demarcation can be drawn between natural gas and natural gasoline, or even between natural gas and petroleum. Any hydrocarbon can exist either as gas, solid, or liquid, its particu'ar state depending upon the temperature, and to a lesser degree, the pressure.

Additional data relating to the combustion of natural gas will be found in subsequent tables.

Industrial or Artificial Gases

The industrial gases used at the present time may be divided into three general classes:

A. Coal gas.
   Carbureted water gas.
   Mixtures of coal and water gas.
B. Producer gas.
C. Oil gas.
   Acetylene gas.

The first class is used chiefly as illuminants, while the producer gas serves almost entirely as a fuel for heat and power.

These commercial gases consist of mixtures of various gases and vapors as shown in the following table.

AVERAGE COMPOSITION OF COMMERCIAL GASES

	Ills	CO	H_2	CH_4	C_2H_6	CO_2	O_2	N_2	Candle Power	B.t.u.
	%	%	%	%	%	%	%	%		
Coal gas	4.0	8.5	49.8	29.5	3.2	1.6	.4	3.2	16.1	623
Carbureted water gas	13.3	30.4	37.7	10.0	3.2	3.0	.4	2.1	22.1	643
Blue water gas	.0	40.9	50.8	.2	.0	3.4	.9	3.5	....	299
Producer gas (coal)	.2	17.6	10.4	2.3	.0	7.3	.7	58.1	....	161
Producer gas (coke)	.0	25.3	13.2	.4	.0	5.4	.6	55.2	....	137
Blast furnace gas	.0	26.5	2.5	.2	.0	12.8	.1	56 9	....	100
Pintsch gas	30 0	.1	13.2	45.0	9.0	.2	.0	1.6	43.0	1,276
Blau gas	51 9	.1	2.7	44.1	.0	.0	.0	1.3	48 2	1,704
All oil water gas	7 0	9.2	39.8	34.6	....	2.6	.2	6 6	19.7	680
Acetylene gas	96.0	....	....	....	....	....	.2	3 2	225 0	1,350
Gasoline gas	1 5			C_2H_4=10.3		18.5	69.7		16.0	514
Oil gas	31.3	2.4	13.6	46.5	3.9	.3	.0	1.1	38.0	1,320

Theory of Light

Before proceeding to a discussion of illuminating gases, it seems advisable to first consider the general subject of illumination.

It is held by some that all substances emit light when heated. That this is true for solid substances is exemplified in the ordinary electric light bulb. The passage of electricity through the tungsten filament heats it to incandescence with the production of visible light. The statement appears a bit dubious, however, when the heating of gaseous substances is considered. For example, hydrogen and carbon monoxide burn with a colorless and blue flame respectively, producing very little, if any, light. The statement may still apply to these gaseous substances in that the apparent absence of light is explained by the fact that the eye is incapable of discerning it. The light may be of a wave length outside the visible range. Thus, while a gas, composed of a mixture of carbon monoxide and hydrogen will serve as an excellent heating fuel, it has no practical value for illumination.

When hydrocarbon vapors (compounds of carbon and hydrogen) are added to the above mixture, light may or may not be produced depending upon the supply of air available for combustion. If the air supplied is sufficient to secure complete combustion of the gas, the products formed are carbon dioxide and water vapor, neither of which emits light while passing through the flame. On the other hand, when the supply of air is limited so that there is not enough oxygen to go around, some of the carbon and hydrogen, forsaking each other, will get left in the mad rush for oxygen partners. Consequently, they will pass out of the flame uncombined and unburned. The heat produced is, however, sufficient to bring these carbon particles, now solid material, to a point of incandescence, and visible light is produced. In this manner, a mixture of carbon monoxide and hydrogen can be enriched with suitable hydrocarbon vapors so as to be useful for practical illuminating purposes as well as for heat and power. This practice is followed in the manufacture of carbureted water gas later described.

Manufacture of Coal Gas

When bituminous or closely allied coals are destructively distilled, three types of products are obtained: Gases, condensed liquids, condensible hydrocarbons and a carbonaceous residue. Commercially, these are known as: Coal gas, ammoniacal liquor, coal tar and coke. The manufacture of coal gas thus consists in the conversion of the solid hydrocarbons existing in coal, into gaseous hydrocarbons and hydrogen by means of dry distillation.

Since coal gas is usually described as a by-product of coke manufacture, the process will vary somewhat depending upon whether coke alone, or also all of its valuable by-products, are to be marketed.

In the "beehive" oven, coke, primarily, is produced, so that the furnace and conditions of operation are designed to promote the yield of coke, while the distillation products are burned in the furnace to heat the charge. As the name indicates, the "by-products" coke oven is designed with additional equipment to handle the by-products such as gas, ammonia and coal tar. This process only will be considered.

The coal is destructively distilled in highly heated, fireclay retorts which may vary considerably in cross-section, length and mode of heating. They are usually arranged in groups of six to eight retorts in what is called a bench. These retorts, which may be set in a horizontal, inclined, or vertical position, are provided with an iron mouth piece and a selfsealing door, besides an ascension pipe to lead off the gases. While the older and smaller plants employ coke or coal for heating, the more modern and larger plants use producer gas, generated either in producers built as an integral part of the bench, or in separate plants. In either case, the primary air for the combustion of the producer gas enters through the regulating shutters at the front of the bench and is preheated by passing around the waste gas flues. As combustion takes place, the hot gases pass up about the retorts and are then drawn back to the front of the bench where they enter the waste gas flues again, giving up their heat to the incoming air. The temperature of the bench is regulated by a proper admission of air through the shutters as well as by a damper set in the stack.

In the combustion chamber the temperature may reach 3,000 degrees Fahrenheit, but in the retorts it is maintained between 1,600 and 1,800 degrees Fahrenheit.

Elementary Impurities

The distillation gases from the retorts pass up the ascension pipe and empty into the hydraulic main where a certain amount of tar is deposited. This crude gas contains, besides the desired hydrogen and hydrocarbons, a considerable number of impurities, such as tar, ammonia, hydrogen sulphide, sulphur dioxide, organic sulphur compounds, naphthalene and cyanogen. It is very necessary to eliminate these impurities before distribution as the products resulting from their combustion in the home have a deleterious effect on household furnishings, besides imparting a very unpleasant odor to the gas. All of the impurities containing sulphur burn to sulphur dioxide which with water vapor forms sulphurous acid. The cyanogen is, of course, a rank poison.

In addition to the impurities just mentioned, the crude gas, leaving the by-

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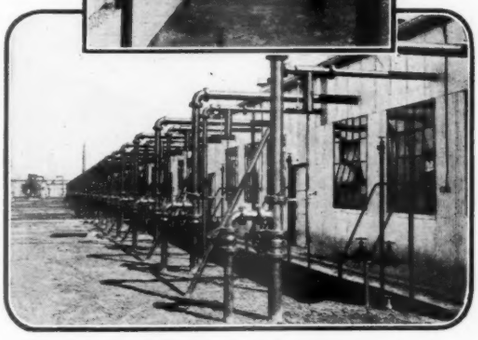

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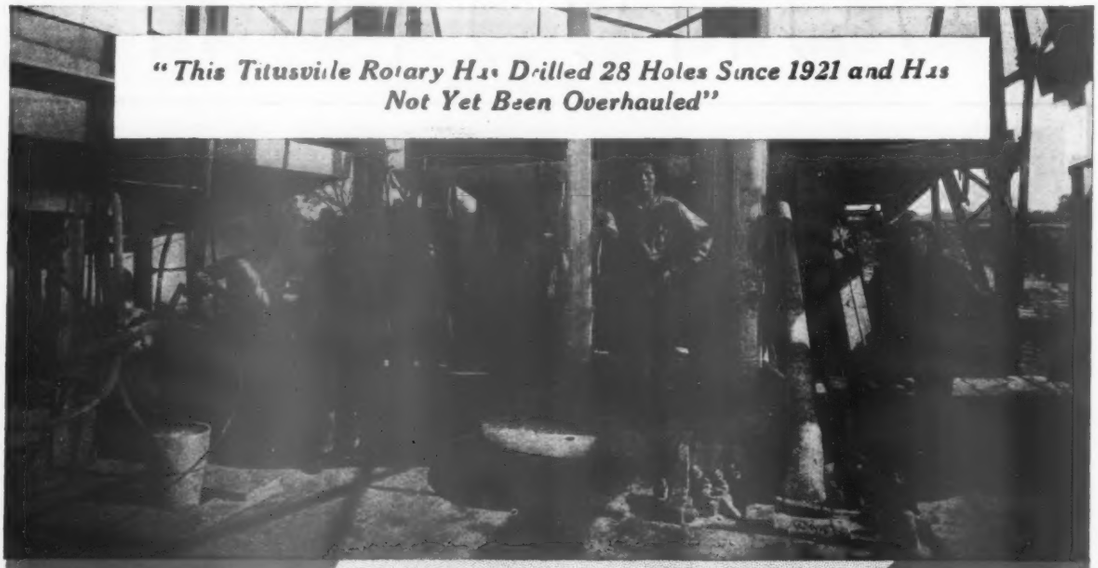

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draulic main at a temperature of 150 degrees Fahrenheit, contains a very complex mixture of hydrocarbons. While some of these hydrocarbons are fixed gases at ordinary temperatures, many of them will condense to liquids or solids when cooled to weather conditions. It is, therefore, of the utmost importance that the conditions of cooling be carefully regulated lest some of the valuable illuminating hydrocarbons be condensed during purification and appear in the tar, or other hydrocarbons fail to condense during purification and cause trouble by condensing later in the street mains.

Leaving the hydraulic main, the crude gas is led through condensers which may be either air or water cooled. The object of these condensers is to cool the gas slowly to about 105 to 115 degrees Fahrenheit which is found to be the most efficient temperature for the removal of tar. If the cooling is very rapid, the tarry matter separates quickly and drags some of the valuable hydrocarbons down with it.

Removal of Tar

While a small amount of tar may be deposited in the condensers, the remainder is removed in the tar extractor. This is brought about by passing the gas through small openings and impinging it against a flat surface to which the tar adheres. Another form of tar extractor consists in passing the gas through small openings into contact with ammonia liquor, by which action the tar particles coalesce and are condensed.

The gas next passes through the exhauster which draws the gas from the retorts, through the hydraulic main, condensers and extractors, acting further as a pump to force it through the remaining parts of the plant and into the storage holder.

From the exhauster the gas passes into one or more of a series of scrubbers and washers for the removal of naphthalene, cyanogen, ammonia, carbon dioxide and hydrogen sulphide. The scrubbers are huge towers filled with wooden frames, coke and other material to break up the upward stream of gas so as to increase the surface exposed to the scrubbing liquid that is sprayed in at the top and passes downward by gravity. The scrubbing liquids used vary according to the processes employed, but they usually consist of an alkaline solution of ferrous sulphate, water or tar oil to bring about the removal of naphthalene.

The remaining impurities in the gas are hydrogen sulphide and organic sulphur compounds which are removed in the purifiers where the gas is brought in contact with some form of ferric oxide. The probable reactions occurring are

$$Fe_2O_3+3H_2S=Fe_2S+3H_2O$$

$$Fe_2O_3+3H_2S=FeS+S+3H_2O$$

The hydrogen sulphide thus combines with the oxide of iron forming a black sludge which settles out. The cyanogen is also removed by combining with the iron to form Prussian blue.

In case the candle power of the gas thus prepared is lower than is required, as is sometimes found, the hydrocarbon content is increased by the addition of benzene vapor. More successful results can be obtained, however, by scrubbing the gas with a heavy oil, thus removing all condensible components and then reenriching with sufficient benzene of high grade to meet lighting specifications.

Chemical Theory of Carbonization

The carbonization of coal may be considered as taking place in three stages:

1. A preliminary decomposition occurs at 650 to 750 degrees Fahrenheit while the mass is in a state of partial fusion. The apparent fusion consists probably in the melting of solid hydrocarbons into a tarry liquid which oozes out of the coal to the surface where it is changed into gases.

2. The gases thus formed consist principally of the higher members of the aliphatic hydrocarbon series. These hydrocarbons now suffer molecular decomposition with the formation of other hydrocarbons containing probably not more than three atoms of carbon. While the first stage is assumed to take place within the coal tar particle itself, the second occurs at the surface or, more likely, within the charge between the coal particles.

3. These gaseous products from the second stage are next subjected to the higher temperatures in the free spaces above the charge as well as the intensely heated surfaces of the retort walls with which they come in contact.

The reactions taking place during the third stage are exceedingly complicated and little understood. An early theory advanced by Berthelot assumes that the primary product of the thermal decomposition is acetylene and that all of the final products are formed by its combination with hydrogen or by the association of several molecules to form ring compounds of the benzene type. More recent work indicates that the cracking of a saturated hydrocarbon results in the formation of two other hydrocarbons, one of which is unsaturated. Both of these may be further broken down, or the latter unsaturated type may combine with hydrogen to form a saturated hydrocarbon again. The natural consequence of this continual breaking down of hydrocarbons would result in the exclusive formation of that hydrocarbon which contains the greatest number of hydrogen atoms per atom of carbon, together with hydrogen. This particular hydrocarbon is methane, which resists thermal disruption of its molecules to a greater degree than any of the other hydrocarbons. It, however, may be decomposed into its elements, carbon and hydrogen. The latter explanation appears, therefore, to be the better of the two and possesses the added advantage of being more nearly the truth. The direct experimental verification of this theory is given in the following tables which shows that with both increased temperature and length of heating, the hydrogen and methane increase at the expense of the ethane and illuminants. The table showing variations of products during distillation further indicates that with prolonged heating the methane is largely decomposed into its elements as shown by the rapid rise in percentage of hydrogen.

While the general course of the distillation follows as indicated, the percentages of products formed depend to a large extent upon the following operating factors:

1. Type of coal used.
2. Temperature.
3. Pressure.
4. Free space above charge.
5. Size of coal particle.
6. Length of heating.
7. Time of exposure of gases to above influences of temperature and pressure.

The specific influences of these factors are so intermingled that it is difficult to ascribe to each its true value as affecting the whole. However, a few results from experimental data will be given to show how the composition of distillation products is affected by change in temperature.

RESULTS OF DIFFERENT CARBONIZATION TEMPERATURES

	Temperature			
	800°F.	1,000°F.	1,200°F.	1,400°F.
Yield, cu. ft. per lb.	.409	1 233	2.319	3.601
Candle power	....	19.7	18 9	16.0
Candle feet	....	24 29	43 38	57.6
B.t.u.	523	651	745	626
Tar, gallons per ton	12 6	23 8	22.4	28.6
Coke, per cent	76 8	69 5	67.8	66 95
Volatiles in coke	22 04	13 00	7 97	5 88
Ammonia, lbs. per ton	37	1 47	2 29	3 71
Illuminants	6.00	5.85	5.75	4 50
CO	4 00	4 90	4.70	7 30
H_2	19 66	22 03	32 13	39 70
CH_4	18 45	30 78	36 53	37.30
C_2H_6	8 02	7 84	8 27	1 60
CO_2	7 80	6.00	3.45	3 20
O_2	60	30	1.20	1.35
N_2	35 47	23 23	7 97	5.05

The outstanding feature of the table appears in the actual doubling of the hydrogen and methane contents during a temperature increase of 600 degrees. Another fact to be noted is that, while the actual yield of gas per pound of coal is increased 80 fold through decomposition of illuminants into hydrogen and methane at elevated temperatures, the candle power suffers only a slight dimunition while the candle feet is more than doubled. The heating value of the gas also increases with rise in temperature to a maximum at about 1,200 degrees Fahrenheit and then declines.

A second factor of equal importance in coal gas preparation is the time of heating. The results of hour by hour heating are given in the table below, the retorts in this case being of the vertical type.

VARIATION OF PRODUCTS DURING DISTILLATION

Hours after charging	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
	%	%	%	%	%	%	%	%	%
Proportion of yield	16.8	14.1	13.0	11.9	11.7	11.2	9.6	6.5	5.3
Candle power	20.7	20.2	19.5	17.9	15.0	12.9	8.1	1.9	....
Heating value in B.t.u.	701	765	707	678	625	597	542	446	400
Ammonia, grains per 100 cu. f	540	440	380	250	250	250	130	70	40
H_2S, grains per 100 cu. ft.	510	470	430	295	285	260	180	100	50
Illuminants	8.05	8.00	7.70	5.60	4.10	3.60	2.80	.80	.30
CO	8.90	7.20	8.40	8.60	7.05	8.60	7.70	7.60	6.30
H	38.25	37.80	36.80	39.00	44.15	45.80	57.40	66.90	68.80
CH_4	38.45	39.60	41.30	42.90	39.60	37.40	27.00	20.70	18.60
C_2H_6	3.00	2.70	1.70	1.30	....	....	....	....	....
CO_2	1.95	2.85	2.40	2.20	1.95	2.50	1.80	1.30	2.70
O_2	.40	.20	.20	.15	.55	.20	.30	.30	.80
N_2	1.00	1.65	1.50	1.15	2.60	1.90	2.00	1.80	2.50

It appears from the foregoing table that no new changes are brought about upon prolonged heating. The total change produced may be considered as the product of the individual factors of temperature, pressure, etc., and the time that the gas was subjected to these influences.

The most noteworthy changes are:

1. The gradual increase of methane up to a maximum at the fourth hour, followed by a slow decline to a lower limit.

2. The gradual decrease of hydrogen to a minimum at approximately the same hour, followed by a regular increase to an upper limit at about the twelfth hour.

The illuminants remain fairly constant up to the fourth hour after which there is rather sudden falling off to negligible quantities. The candle power values suffer a corresponding decrease as is to be expected.

Effect of Pressure

The effect of pressure upon the distillation while not examined with the same precision is, nevertheless, worthy of some consideration. While too low a pressure may result in the adulteration of the coal gas by the passage of furnace gases through the retort walls, too high a pressure generally brings about excessive decomposition and the formation of graphitic carbon. The results of practical experience dictate ordinary atmospheric pressure as the optimum condition of operation. This pressure should be maintained as constant as possible throughout the entire period of distillation.

Since the composition of the gas can be controlled in a general way by the proper regulation of the conditions of temperature, pressure, etc., the course of preparation and the type of gas produced will be determined by the particular standard demanded by the consumer. In former days coal gas was employed primarily as an illuminant and the manufacturer so regulated his conditions of operation as to enhance the production of those hydrocarbons possessing high illuminating qualities. At the present time, the illuminating value of a gas is still prescribed as the standard by the Public Service Commissions of many of our larger cities. Recently, however, the tendency has been to do away with the standard of illumination and to substitute the heating value as the statuary standard. This change in specification is due to the fact that the use of gas for illumination is steadily decreasing, while its use for strictly fuel purposes is constantly increasing. This tendency is illustrated by the following data:

	For Illumination	For Fuel
1905	74%	26%
1920	32%	68%

In the United States at present, it is customary to mix other gases with the coal, the resulting mixture going under the name of illuminating gas. This gas also serves as a domestic fuel in various types of gas stoves and heaters. Even as an illuminant, its value at the present time is largely coincident with its fuel value, since the introduction of Welsbach mantles requires a heat sufficiently great to maintain it at incandescence. The light is thus secured by heating the solid material of the mantle to incandescence instead of that obtained from the incandescent carbon particles in the ordinary

(Continued on Page 220)

GAS PRESSURE REGULATION IN LINES AND DISTRIBUTION

By F. I. Thompson*
Westcott & Greis, Inc., Tulsa

We have been asked to address you on the subject of regulators and of gas pressure regulation in pipe lines and distributing plants. It is an important subject. Much time, money and effort is spent in the manufacture of meters and the reconditioning of these meters in your repair shops after they have been in service for five years or less, to bring them within very close limits of accuracy, only to be wasted due to poor pressure control.

In the large majority of cases which we are called upon to determine the reason for poor regulation, we find that the trouble is equally due to the valves being too large for the demand upon them, dirt, and the improper application of various types of construction. Most regulators are made so that it is possible to change the diaphragm sizes in order to vary the outlet pressure which they govern. When these changes are made with regard to the valve body and the design of the valve, this is an advantage. Frequently, when these points are not considered, it results in unsatisfactory and erratic pressure control, if not in broken regulators. It is well to consider the amount of weight which the standards and the diaphragm covers have to support. For example, a 6-inch regulator with the following sizes of diaphragms has to be made to carry a heavy load. A 24-inch diaphragm at 4 ounces per square inch gauge pressure carries a total deadweight of 121 pounds in round numbers; at 8 ounces, 243 pounds; at 1 pound, 485 pounds, while a 14-inch diaphragm under 5 pounds pressure carries 770 pounds; and at 8 pounds pressure, 1,231 pounds, and a 5-inch diaphragm at 50 pounds pressure supports 982 pounds. In all cases, this relatively small pressure per square inch necessitates the standards and diaphragm covers being of considerable strength. It is, therefore, not surprising that these parts sometimes break when the pressure is applied to them suddenly.

How Regulator Works

What is exactly a regulator, and how does it work? It is essentially a weight scale. The pressure which you desire to carry is applied to the diaphragm, which must overcome the weight on the lever arm, or have the weight overcome it, or be a perfect balance. At the point of this balance is the pressure which you desire to carry and there is no power to operate the valves. In low pressure distribution work you desire to have changes in pressure of a quarter of an ounce or less per square inch produce

(Continued on Page 155)

*Before Fifth Annual Gas Meter Short Course, University of Oklahoma, Norman, April, 1928.

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USE OF SIPHONS FOR HANDLING WATER

(Continued from Page 108)

up and the volume too, with consequent higher sales delivery.

So the problem amounts to lifting a certain amount of water a certain height with the least amount of gas

It is not intended here to go into lengthy scientific considerations but to give sufficient to make clear the principle of the working factors of jets. By supplemental reference to technical books on thermodynamics one sufficiently interested can make applied and understandable applications of jet siphons to the individual problems affected by local conditions of gas fields and gas wells.

Method of Approach

Due to usual mechanical hazards accompanying handling of long strings of small pipe the less the siphon is handled after first installed the better. That increases the importance of careful visualization, computation and preparation, or method of approach to each well.

To begin with, the following factors should be determined:

1. Amount of salt water in barrels of 42 gallons made or capable of being made by gas well in 24 hours. Most experienced field men can estimate closely the amount of water a well is capable of making but when closer accuracy is necessary it can be determined by bailing or sometimes by running a small receptacle like a three eighths by 18-inch nipple on measuring line or an electric bell ringing device to determine the rate of water column built up in 24 hours.
2. Weight of salt water per gallon. Usually about 8.5 pounds.
3. Open flow volume of well. Cubic feet of gas in 24 hours read through top of gas string or converted from smaller connection reading to reading through size of gas string.
4. Open flow volume available for each barrel of water to be lifted.
5. Shut-in pressure of well. Pressure reading taken by gauge at surface connections when well has been shut in long enough to build up to maximum pressure.
6. Reservoir pressure (in pounds per square inch absolute). Shut-in pressure plus head pressure due to column of compressed gas in hole plus head pressure due to column of water plus atmospheric pressure.
7. Internal diameter of casing (gas string).
8. Diameter of open hole below casing.
9. Casing point.
10. Total depth of well.
11. Depth to top of gas sand.
12. Atmospheric pressure.

From those general factors can be determined the following siphon factors:

13. Twenty-four hour water level in casing, in feet from bottom of hole.
14. Difference in feet between water level in casing under shut-in pressure and level in siphon open to atmosphere at top.
15. Size of pipe necessary. Determined by the amount of water to be handled and capacity of siphon pipe under the expected flow pressure and velocity. The following table will help:

Size Inch.	Internal Diameter Inches	Cross Sectional Flow Area Sq. Inches	Length of Pipe Containing 1 Cu. Ft. Linear Feet	U. S. Gallons Contained in 1 Linear Ft. of Pipe Gallons	Water Contained in 1 Linear Ft. of Pipe Pounds
3/4	.824	.533	270.03	.0277	.2309
1	1.049	.862	166.62	.0449	.3743

The water flow capacity of siphon pipes is based on the cross sectional flow area and the amount of fluid to pass through in a given time. If the water to be lifted every 24 hours is 50 bbls. and it will take, say, 7,500 cubic feet of gas at siphon head to lift it (a gas-water ratio of 150) then the total cubic feet of gas and water flowing through top of siphon in 24 hour will be 10,300. In 1-inch siphon pipe with a cross sectional flow area of .862 square inch that total volume of 10,300 cubic feet will have a velocity of 1,716,663 linear feet in 24 hours or 19.8 feet per second. Since that is slow for very efficient flow the 1-inch would have to be figured for operating about 10 hours a day or the size of siphon pipe decreased, which would have to be three-quarters inch as there are no other practical smaller sizes.

16. Level of starting jet: This jet is here called the starting jet because it is the jet on which computation is based to start flowing a column of water built up in 24 hours. In other words if the well were clean and then shut in and water allowed to build up for 24 hours this jet would start the water moving. It should be placed just above factor No. 13 (the 24-hour water level, in feet from the bottom of hole). In some shallow wells this jet often is all that is necessary.

17 Size and number of jets: Certain size jets have certain gas flow capacities under certain pressures; and, under expansion from the high pressure side of the jet to the low, a cubic foot of gas at the expense of a certain amount of heat is capable of a certain amount of work.

Isothermal Expansion

If, in siphons the moving water and the pipe in contact with the expanding gas fully replenish the gas with heat through contact then that heat is converted by the gas into equal additional work Such a condition is called isothermal expansion. If no heat is received by the gas from the moving water or from the pipe the work is done with a gradual fall of temperature of the gas in its travel from the jet level upward. Such a condition is called adiabatic.

Siphon expansion conditions are not perfectly isothermal or adiabatic but for computation for siphon installation the isothermal formula for work is applicable to the starting jet while the spacing of the upper jets should allow for an adiabatic condition. Such allowance is at present not a matter of formula.

The gas that passes through the starting jet does not expand to atmosphere, due to the broken column of water passing the jet, with which the gas mixes. In the illustration already mentioned under factor No. 15 the moving mixture in 24 hours was a total of 10,300 cubic feet, 7,500 of it gas and 2,800 water. The expansion of gas inside of siphon consequently is not to atmosphere but for computation purposes to a point based on the ratio of gas and water in the mixture.

The size, number and spacing of jets in an installation is dependent upon the amount of work to be done and the amount of gas necessary to do it.

Work is expressed in foot-pounds. A barrel (42 gallons) of salt water weighing 357 pounds would, to lift it 2,000 feet, require 714,000 foot-pounds of work, friction excluded.

The isothermal expansion formula for determining the amount of work that theoretically can be accomplished by a cubic foot of gas under certain pressures is:

Where W = Work in foot-pounds.

Pa = Pressure of gas in casing at jet level in pounds per square foot absolute. (Shut in pressure plus atmospheric × 144.)

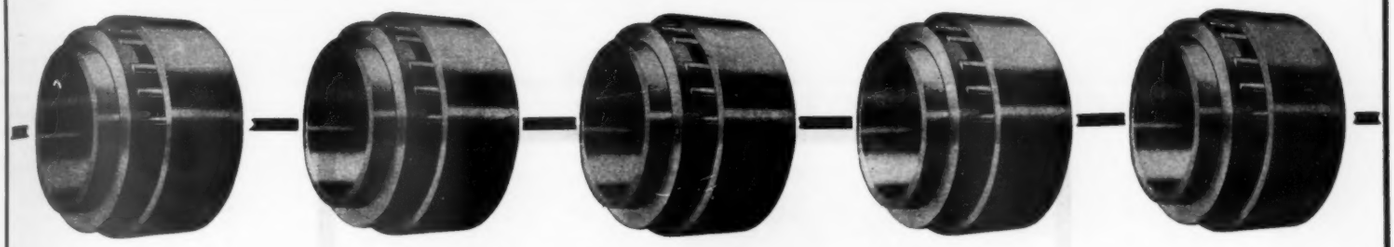
Pb = Pressure of gas in siphon after expansion through jet, in pounds per square foot absolute (computed for siphon installation but later based on the manometer reading of siphon discharge plus atmospheric × 144.)

$\log_e = 2.3$

Vb = Volume of the original cubic foot of gas after expansion through jets.

$$W = Pb\ Vb \log_e \frac{Pa}{Pb}$$

By applying the needed figures of the individual problem that basic formula can be used for determining the theoretical amount of work of which 1 cubic foot is capable, assuming isothermal expansion. By dividing the total amount of work necessary by the work of 1 cubic foot the total needed amount of gas is theoreti-



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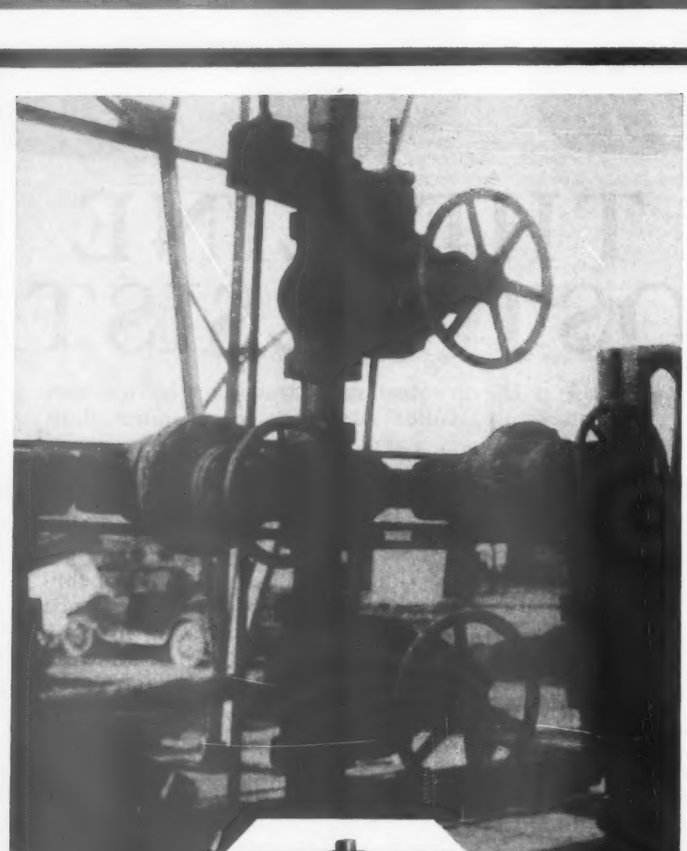

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cally determined for the installation of jets.

Size of Jets

The size and number of jets are based on the needed amount of gas. To help in this the following table is included:

Capacity of jets in standard cubic feet of gas per 24 hours open to atmosphere on discharge side.

Shut in Press. of Well	Size Jet 1/64	1/32	1/16	1/8
100	500	2,000	8,000	32,000
200	1,000	4,000	16,000	64,000
300	1,500	6,000	24,000	96,000
400	2,000	8,000	32,000	128,000
600	2,500	10,000	40,000	160,000

A practical size jet is one-sixteenth inch and should be used whenever possible. The kinetic efficiency of gas bubbles through four one-sixteenth inch jets is greater than through one one-eighth inch jet. When four are used at the same level they are drilled at equal distances around the nipple. The jet nipple is just a plain 1 or three-quarters by 6-inch nipple with long threads. The jet could be drilled in a collar marked for easy identification.

Between the starting jet and lower perforations it is well to put another jet to pick up the flow when column of water has lowered beyond the efficient flow point of the starting jet. The placing of upper jets, where necessary, is based on a division of the amount of gas necessary to do the required work and with consideration of a possible adiabatic condition in the moving column of expanded gas and water.

Operation of Siphons

A siphon installation is figured to operate on a basis of 24 hours water and gas production but when a well has built up a head for several days the siphon when installed first has to be hung up high enough to start the water and later lowered. Or, in the case of too great a head or a well temporarily drowned, extraneous gas pressure applied.

At times it is necessary to start a well by "rocking," which is turning the pressure into the top of casing, then into the top of siphon, release the casing pressure, rebuild it, release the siphon pressure, etc., until well starts.

When siphon becomes plugged with mud or cavings it often can be cleaned by releasing the casing pressure and putting extraneous pressure on siphon.

To allow the taking of water along with the delivery gas, separating them in a drip and to allow "rocking" it is necessary to install combination connections at the surface. A photo of siphon connections accompanies this article.

VARIOUS FLOW OF GASES THROUGH SMALL ORIFICES

(Continued from Page 112)

1.4; for natural gases, the value of k averages approximately 1.30. This difference in the ratio of specific heats demonstrates the necessity of using different coefficients for the flows of air and natural gases through orifices other than making corrections for gravity. The empirical formulas are formulated so as to approximate as closely as possible the thermodynamic formulas; and the thermodynamic formulas, in turn, involve the ratio of specific heats. Table 1 shows the comparative values of the term Q/P for air and gas for the different orifices. These data were obtained from experimental observations.

where Q = the defined cubic feet per minute.

A = area, square inches.

P = upstream pressure, pounds per square inch, absolute.

T = absolute temperature.

The experimental tests gave the following relation for the flow of air through straight-edged orifices:

$$Q = 352.5 \frac{AP_1}{\sqrt{T}}$$

For the flow of air through trumpet orifices, the relation was

$$Q = 409.5 \frac{AP_1}{\sqrt{T}}$$

Therefore, the efficiencies of the

TABLE 1—Comparative Flows of Air and Gas Through Difference Orifices—Based on 520 Degrees Fahrenheit and G=1

Condition of Flow—	Orifice	Value of Q/P— Gas	Air	Difference per Cent
Constant	1/32-in. trumpet	0.01361	0.01404	3.06
Downstream	1/16-in. trumpet	.05406	.05542	2.45
	1/16-in. trumpet	.05432	.05542	1.98
	1/16-in. straight	.04685	.04812	2.64
	1/16-in. straight	.04700	.04812	2.33
	1/16-in. straight	.04680	.04812	2.74
Constant	1/ 8-in. straight	.2003	.2060	2.77
Upstream	16—1/64-in. straight	.04725	.04856	2.70
	1/16-in. straight	.04682	.04812	2.78
	1/16-in. trumpet	.05394	.05542	2.74

The apparent difference between the value Q/P for air and gas can be explained as follows:

$$\text{For gas, } Q_m = 862.8 \frac{AP}{\sqrt{GT}} 1 \left(\frac{K}{K+1}\right)^{\frac{1}{2}} \left(\frac{2}{K+1}\right)^{\frac{1}{K-1}}$$

where Q_m is flow, cubic feet per minute.
Assume k = 1.3 for natural gas

$$\text{Then } Q_m = 862.8 \frac{AP}{\sqrt{GT}} 1 \left(\frac{1.3}{2.3}\right)^{\frac{1}{2}} \left(\frac{2}{2.3}\right)^{\frac{1}{K-1}}$$

or solving,

$$Q = 407.28 \frac{AP_1}{\sqrt{GT}}$$

For air, using k = 1.4,

$$Q = 417.72 \frac{AP_1}{\sqrt{T}}$$

Therefore, per cent possible variation = 417.72—407.28 = 2.5 per cent.

417 72

In other words, there should be a difference of 2.5 per cent in the values of the coefficients for air and for gas with a ratio of specific heats of 1.3 when the empirical formulas as shown in this report are used.

Efficiencies of Orifices

From thermodynamic relations, for "critical" flow, the rate of flow of air through an orifice is expressed by the relation

$$Q = 417.72 \frac{AP_1}{\sqrt{T}}$$

straight-edged orifices is approximately

E = 352.5 / 417.78 = 0.84

The efficiency of the trumpet orifices is approximately

E = 409.5 / 417.78 = 0.98

Summary of Conclusions

The conclusions of the study and experimental work relative to the flow of air and natural gas through small orifices, as described in this report, may be summarized briefly as follows:

(1) There are three general combinations of pressure relations in field practice; flow from a series of different upstream pressures into a constant downstream pressure; flow from a constant upstream pressure into a series of different downstream pressures, and flow from each of a series of different upstream pressures into each of a series of different downstream pressures.

(2) Each of these three combinations of pressure relations is, in turn, under either of two specific conditions; the flow is either "critical" or "noncritical." If

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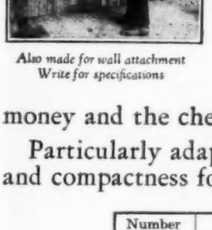

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1585	Double (Heavy)	3-0 x 6-5	93
1585	Double (Heavy)	2-6 x 6-5	85
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the flow is "critical," the velocity is constant and the flow is regulated by the density; therefore, if the upstream pressure remains constant, the flow does not change regardless of the change in the downstream pressure. Also, if the flow is "critical," the quantity of flow per unit of time is directly proportional to the absolute pressure If the flow is "noncritical," the quantity of flow per unit of time depends upon both the upstream and downstream pressure.

(3) The same formulas for solving problems involving "critical" and "noncritical" flow are applicable to each of the three general conditions of pressure relations. Therefore, for any specific problem to be solved for practical application, it is necessary to determine only whether the flow is "critical" or "noncritical" and then make the required substitutions in the formula which will apply to the conditions of the problem.

Critical Ratio of Pressures

(4) The value of the "critical ratio of pressures" from a practical standpoint differs from that developed from a thermodynamic analysis. The results of the experimental tests show that for air and gas flowing through the orifices described in this report, the flow is "critical" when the ratio of downstream to upstream pressure is less than values varying from 0.55 to 0.62; and the flow is "noncritical" when the ratio of downstream to upstream pressure is greater than values varying from 0.55 to 0.62.

The values which define the "critical ratio of pressure" depend upon the shape of the orifice as well as upon the characteristics of the gas. Theoretically, for a true orifice and a perfect gas with a ratio of specific heats of 1.4, the critical ratio of pressures should be 0.53. Therefore the values as given above apply strictly only to the conditions under which the experiments were made.

(5) The formula which has been used in this report to solve problems involving "critical" flow of gases is

$$Q = \frac{C\ A\ P_1}{\sqrt{GT}}$$

where Q is the quantity of gas in defined cubic feet per minute,

C is the coefficient,

A is the cross-sectional area of orifice, square inches,

P_1 is the upstream absolute static pressure,

G is the gravity of the gas, and

T is the absolute temperature of the gas.

This is an empirical formula and was derived experimentally by first determining the relation between quantity and upstream pressure, then making the proper corrections for gravity and temperature and area, and then determining a coefficient which would satisfy the conditions of the equation. It is based upon the thermodynamic formula which shows that the quantity is directly proportional to the absolute upstream static pressure and cross-sectional area of the orifice and inversely proportional to the square roots of the gravity and absolute temperature.

Formula Used

(6) The formula which has been used in this report to solve problems involving the "noncritical" flow of gases is

$$Q = \frac{C\ A\ \sqrt{P_1(P_1 - P_2)}}{\sqrt{GT}}$$

where Q is the quantity of gas in defined cubic feet per minute,

C is the coefficient,

A is the cross-sectional area of the orifice,

P_1 is the upstream absolute static pressure,

P_2 is the downstream absolute static pressure,

G is the gravity of the gas, and

T is the absolute temperature of the gas.

This is an empirical formula. It is based upon the assumption that under any definite pressure conditions the flow depends upon both the upstream and downstream pressures.

This formula is similar to the generally accepted orifice meter formula, both of which are applicable to "noncritical"

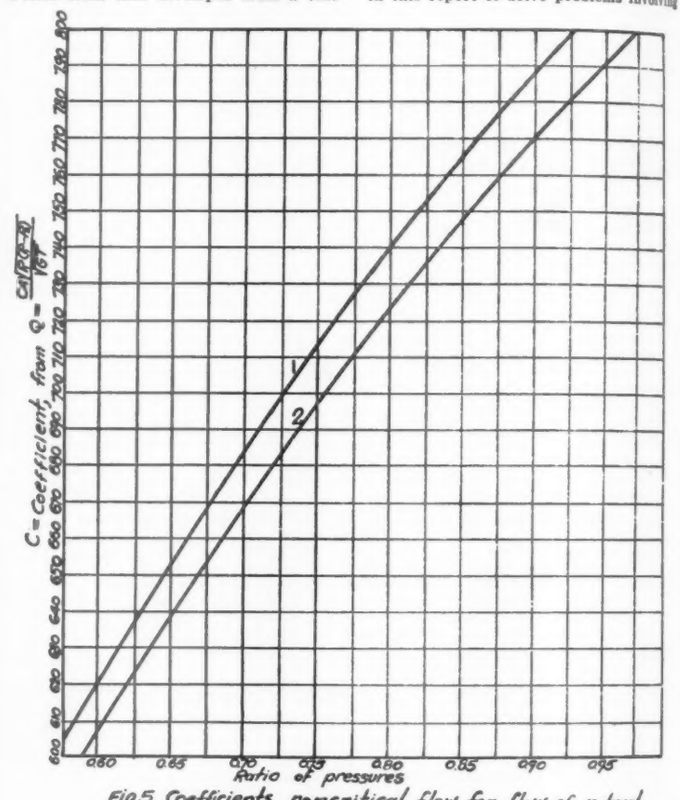

Fig. 5. Coefficients, noncritical flow for flow of natural gas through trumpet orifices.
(1) Coefficients based on 14.4 lbs. per sq. in.
(2) Coefficients based on 14.7351 lbs. per sq. in.

When P_2/P_1 > Critical Ratio, $Q = \frac{CA\sqrt{P(P-P_2)}}{\sqrt{GT}}$

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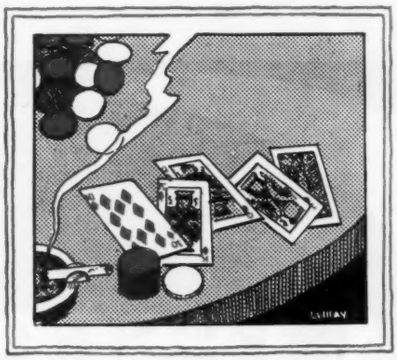

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flow. The orifice meter formula in its simplest form is

$$Q = \frac{C\sqrt{hP}}{\sqrt{GT}}$$

where Q is the quantity, cubic feet per minute,
C is the coefficient,
h is the differential pressure, inches of water,
P is either the upstream or downstream absolute static pressure,
G is the gravity, and
T is the absolute temperature.

In the orifice-meter formula, when determining the coefficient, it is necessary to consider the effect of the velocity of approach and therefore to derive coefficients for each ratio of orifice to pipe diameter. For the small orifices described in this report, the velocity of approach effect is negligible.

(7) For "critical" flow, the coefficient is the same for any pressure ratio.

(8) For "noncritical" flow, if the formula in (6) is used for calculation purposes, it is necessary to consider the relation between the coefficient and pressure ratio (ratio of downstream to upstream pressure). In other words, for each pressure ratio, there is a different coefficient that should be substituted in the formula. Values of these coefficients can be obtained from Figures 2, 3, 4 and 5.

Coefficients

(9) The coefficients for both "critical" and "noncritical" flow which were derived in this reports are as follows:

Flow Condition—	Pressure Base Lbs. per sq. in.	Air		Gas	
		Straight Orifice	Trumpet Orifice	Straight Orifice	Trumpet Orifice
	14.7351	344.5	400.2	336.7	388.0
"Critical"	14.4	352.5	409.5	344.5	397.0
		See Fig. 2	See Fig. 3	See Fig. 4	See Fig. 5
"Noncritical"					

The coefficients given above apply strictly only to the orifices which were used to determine them. A drawing showing the construction of the orifices which were used is given in Figure 1.

(10) The coefficients for both "critical" and "noncritical" flow as derived in this report are based upon the assumption that the gas does not deviate from Boyle's law in its pressure-volume relation. If it is desired to determine the actual quantity of gas that would flow through the orifice by correcting for deviation from Boyle's law, the quantity as calculated from the formula in (5) or (6) should be multiplied by the square root of 1 plus the percent deviation, where the deviation is expressed in decimals. For instance, if the deviation is 10 per cent, the correction factor is $\sqrt{1 + .10}$ or $\sqrt{1.10}$.

(11) The efficiency of a straight-edged orifice as used in this report was found to be 0.84 or 84 per cent; that of a trumpet orifice was found to be approximately 98 per cent. The figures are based upon "critical" flow and represent the ratio between the actual and theoretical coefficients.

DENVER LINE GREAT ENGINEERING FEAT

(Continued from Page 83)

the Black Forest east of Colorado Springs where heavy timber had to be cut. Approximately 2,000 car loads of pipe and material were required for the job, of which 139 cars consisted of couplings and 19 cars of bolts. Pipe and equipment was unloaded from the railroads and transported to destination by trucks and trailers, of which 90 2-ton trucks were used. Selection of unloading points was made with a view to unloading same and stringing along the route in the most economical way. This sometimes resulted in transporting material greater distances than the maps might indicate as being necessary, the economical features being worked out by the engineering department in Colorado Springs on the basis of freight rates, unloading facilities, kind of ground to be covered, and other factors. Unloading gangs usually consisted of 15 men, a 2-ton truck and a ginpole, which unloaded 10 cars a day, or 450 joints of 20-foot pipe. This meant the unloading, rolling and piling of a joint per minute. In open country the ditching gangs averaged 1 mile per working day. The work involved the trenching, painting any laying of the pipe and backfilling. Gangs frequently laid 12,000 to 13,000 feet of pipe in eight and one-half hours. The ditching machines, pipe cranes and backfillers used were supplied by the Buckeye Traction Ditcher Co.

Material Used

Plain-end pipe was used for the most part, these being connected with Dresser couplings. Screwed pipe half an inch thick was used to cross the rivers. Collar-leak clamps were attached on each joint. The river clamps over each joint weighed 1,550 pounds each, these being machined on the inside to fit the pipe exactly. The river crossings furnished no great problem on account of the low stages of the water. Headers, or manifolds, were used, there being 6 lines of 10-inch pipe used in crossing the Arkansas River and 7 lines of 10-inch pipe in crossing the Huerfano. The joints for the river crossings were first connected and the river clamps attached after which they were dragged across the beds and laid in position, after which the trenching was done and the pipes lowered. The lines across the river were all bowed upstream to offer greater resistance.

The pipe under railways and highways were all welded, reinforced and strapped and tested to 500 pounds hydrostatic pressure. The pipe at all such places after being welded was annealed and allowed to cool slowly. Inspection of work on the entire job was most rigid, there being three inspectors with each gang. Painting of pipe before it was connected was given very careful attention and was done in accordance with specifications compiled from the soil analysis. After pipe was rolled onto the skids, it was cleaned with a saddle brush after which bitumastic enamel was applied with a rolling rig, this equipment assuring an even application of the paint to the required thickness.

Formations Encountered

Corrumpa Canon in Union County, New Mexico, was one of the first canons through which the pipe had to be laid.

Twenty-two-inch pipe ready for lowering.

It proved not to be a very bad canon to negotiate since the walls sloped gently. The only difficulty encountered was the water. The flow was not large but the soil was very porous and there was considerable seepage. After leaving this canon the line hits a fair plains region The formation from Corrumpa Canon to the Trevasser Canon was mostly volcanic. Nalapic and rotten flint stone

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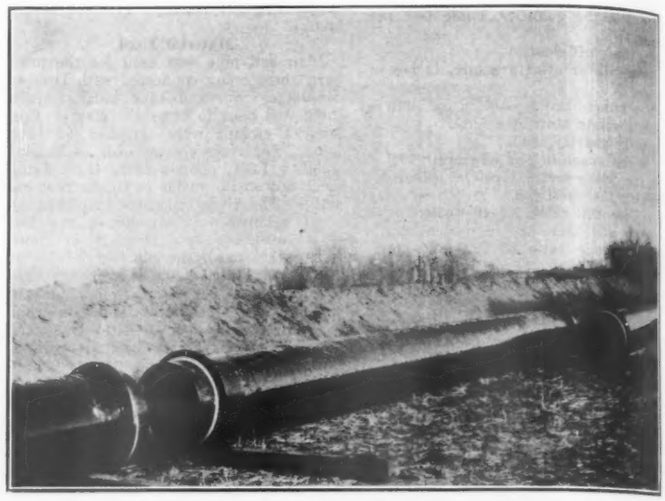
(nuggets encased in crumbly material) was encountered and proved to be very difficult rock. In this region the formation appeared to be lava and the assumption is that the canons were formed by the process of erosion.

The right of way upon reaching Travesser Canon showed a 600-foot drop at an angle of 45 degrees. The distance across the bottom of the canon was 5¼ miles. This canon proved interesting from a standpoint other than the construction work. Upon its walls are pictures evidently painted by Indians with their fingers many years ago. The presence of these pictures in the canon is said to have been known among the Indians for more than 100 years. The workmen found numerous arrow heads and other evidences of the presence of the Red Men in past ages.



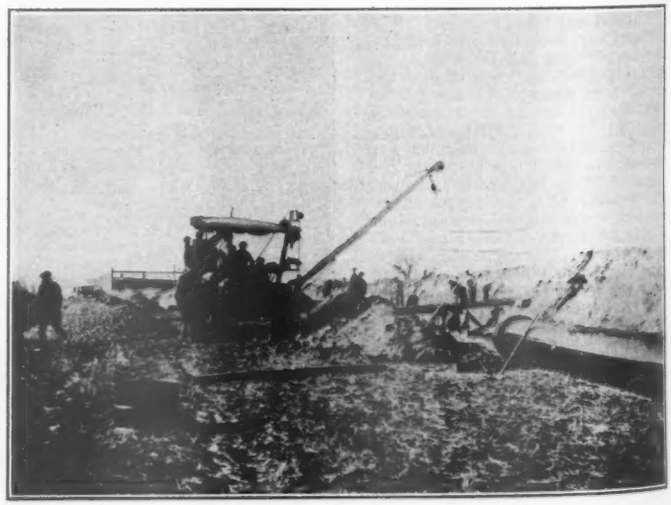
Enameled 20-inch pipe ready for lowering.

Header for Arkansas River crossing.

After leaving Travesser Canon, between the north side and south side of the Cimarron Canon, there was 3¾ miles of solid rock (sandstone and granite) where the ditching had to be done by hand with the aid of air compressor drills, black powder and dynamite. Just before crossing the Colorado line, the route went through Long Canon, a branch of the Cimarron, and entered Colorado on the western side of the Black Mesa, 15 miles from Branson. Here, again, it was necessary to let the pipe down the sides of the canon on sledges, one joint being snubbed down at a time and laid end to end after which they were connected and welded.

Drop of 500 Feet

The next important canon was the Purgatoire, in Las Animas County, Colorado. There was a drop of 500 feet on the south side of the canon with the river at the bottom and a distance of three-fifths of a mile across the bottom to the north side where there was another rise of 500 feet. There was considerable rock work and blasting in this canon and a 20-foot cut was made through solid rock at the top in order to reduce the bend of the pipe. North from that point there was considerable prairie country. The Taylor Arroya required some rock work, but there were no steep banks, and Timpas Creek proved to be only a draw that offered no serious



Pipe crane holding welded section until ditch is cleared.

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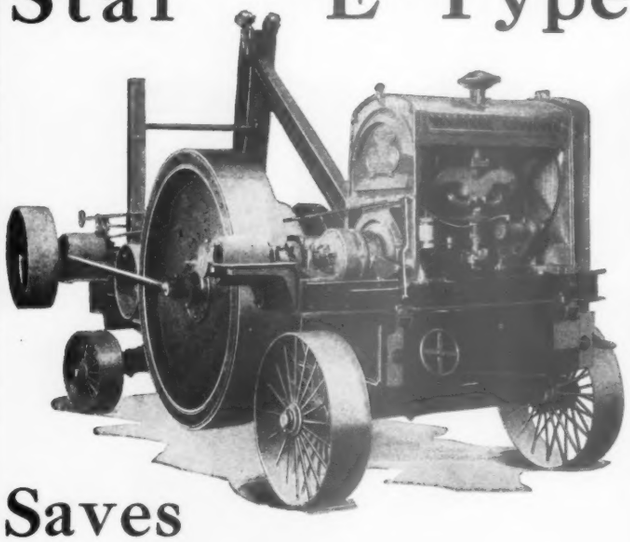

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difficulty. There were few railroad crossings to be made. The only one on the Texas division was at Dalhart where it had to cross the Rock Island tracks. The next was the Atchison, Topeka & Santa Fe main line at a point near West, Colo., followed by the Missouri Pacific and Santa Fe tracks near Pueblo. On the Denver end, the Rock Island and Colorado & Southern tracks were crossed.

CHANGE TO NATURAL GAS SUPPLY BEING WORKED OUT AT DENVER

By Tolbert R. Ingram

DENVER, Colo., May 7.—While the work of completing the Amarillo-Denver pipe line is under way, the public utility companies serving Denver and Pueblo are taking the necessary steps to convert their systems over from manufactured to natural gas. The Public Service Co. of Colorado, a subsidiary of the Cities Service Co., owns the distribution system in Denver, and operates under a franchise which has 20 years to run from February 8, 1927, when it was voted by the people. The Pueblo Gas & Fuel Co., a subsidiary of the Public Service Co., also operates under a new franchise recently granted in anticipation of the bringing in of natural gas. The question of supplying gas to Colorado Springs and other communities by the Cities Service organization remains to be worked out.

Extension programs covering several years' growth have been worked out for both Denver and Pueblo, but the main problem of equipping the systems for the use of natural gas will receive attention this year. The Denver company will expend approximately $750,000 to make the change, while Pueblo costs will be proportionately much smaller.

Distribution in Denver

The Colorado Interstate Gas Co. will deliver the gas to the public Service Co. from its 20-inch line at the southeastern edge of Denver. The Public Service Co. is constructing a 7-mile, 20-inch feeder line from the intake point to its main gas plant at Seventh and Wewatta Streets near the heart of the business section of the city, and another main feeder of the same size to its No 3 Holder station at East Thirteenth Avenue and Harrison Street. No. 4 station and No. 7 station, both serving South Denver, will be fed by takeoffs from the main feeder lines and the Capitol Hill district station will have a connection from No. 3 station. This work is included in the immediate program and provides the facilities for putting the natural gas into the distribution system. The cost of this part of the work will be approximately $450,000. Another $100,000 will be expended in converting old mains for natural gas use, and $175,000 will be the approximate cost of adjusting customers' appliances, which with cost of office work and conducting a school of instruction for employes, will bring the cost of this year's program up to $750,000.

Industrial Possibilities

The entire program calls for an intermediate system entirely encircling the city and when completed will have a carrying capacity of 100,000,000 feet a day as compared with 13,000,000 feet capacity of the manufactured gas system. This development, however, will extend over several years, and in the meantime a survey is being made of the industrial possibilities of the city. No definite program has yet been worked out for building up an industrial market as the present year's activities will be centered in making the conversion for domestic consumers. There are 73,000 domestic customers in Denver and they use an average of 28,000 feet of manufactured gas per year. There is no way of estimating the average consumption for natural gas as there is a wide variation in the heating content of the two gases. The company figures on about 4,000 installations for heating purposes by the first of the year.

Adjustment of Appliances

The adjustment of appliances and making the change for domestic consumers is to be one of the large tasks. The company has a corps of 300 employes who are being schooled in the technique of the work. It is estimated that it will take about a month to complete the task. Necessary equipment is now being stored at strategic points in the city and the city is being divided into 10 districts. The crew will work in one district at a time and it is expected that three or four days will be required for each district. When natural gas has been introduced into that district and all adjustments are completed, the crew will move into another, and continue the work progressively until the entire city has been converted over. One of the features of the instruction of the small army of employes is a "chamber of horrors," as they call it, in which apparatus is placed and so controlled that any kind of emergency which may develop can be brought about for test purposes to instruct the employes just what to do.

The changes at Pueblo will be made along the same line, but not on so extensive a scale since it is not as large a city as Denver. The Pueblo program calls for an expenditure of approximately $300,000, but this extends over a period of two or three years and depends upon the consumption demand created. The principal installation will be a 14-inch line from the Colorado Interstate's discharge point to the distributor's central plant from which intermediate pressure feeders will be constructed to the various distribution stations. Governor stations will be installed at intervals to reduce the pressure to the requirements for domestic consumption. The system will carry gas at a pressure of 40 pounds to the square inch downward. The Pueblo distribution system is entirely separate from the service to the plant of the Colorado Fuel & Iron Co. at Minnequa, which will be served from a single meter by the Colorado Interstate company.

Ditch section at top of north ascent from Long Canon, New Mexico.

SHELL PIPE LINE STATEMENT

The Shell Pipe Line Corp. reports that in March its runs of crude oil were 2,848,173 16 bbls., an average of 91,876 bbls. per day, and its shipments 2,506,112.95 bbls., or a daily average of 80,842 bbls. This shows a gain over its February business of 14,532 bbls. per day in runs and 3,854 bbls. a day in shipments.

30 Years of Progress

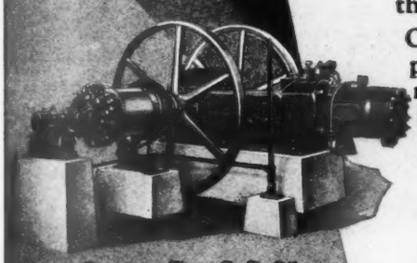
and still leading in specialized power equipment for the Oil Industry

FOR 30 years Bessemer has been specializing in power equipment for the Oil Industry—constantly improving and pioneering to meet the ever-changing operating conditions throughout the world's oil fields.

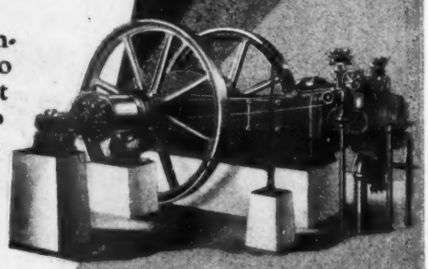
Old types of equipment have been improved to the nearest attainable point to mechanical perfection; new equipment has been developed and perfected to meet new needs; and each product in the Bessemer line has earned its position of leadership solely on its merits in competitive service.

After three decades of unceasing progress, Bessemers continue to stand out as by far the greatest value in oil field power equipment—living up to their truthful slogan, "You buy the best when you buy a Bessemer."

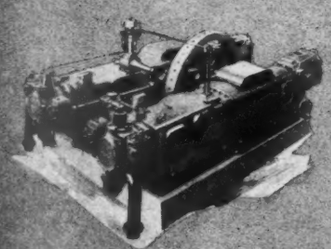
THE BESSEMER GAS ENGINE COMPANY
52 York Street ∴ ∴ Grove City, Pa.



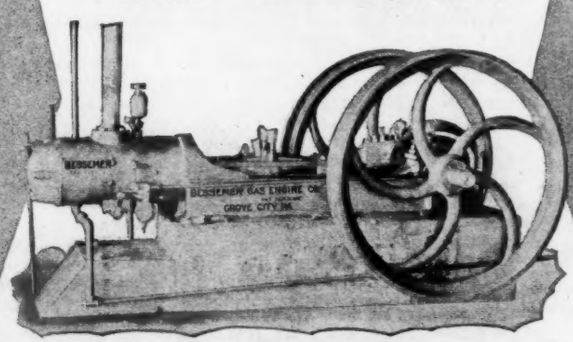
Bessemer Type O. F. Oil Field Engine

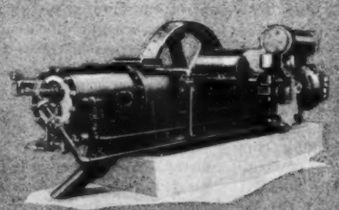


Bessemer Four-Cycle Oil Field Engine



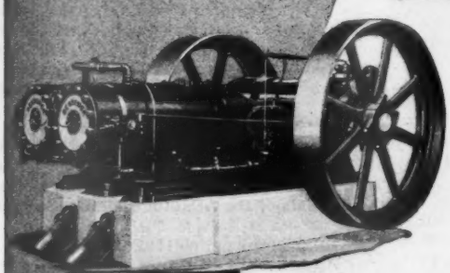
Bessemer Four-Cycle Compressor



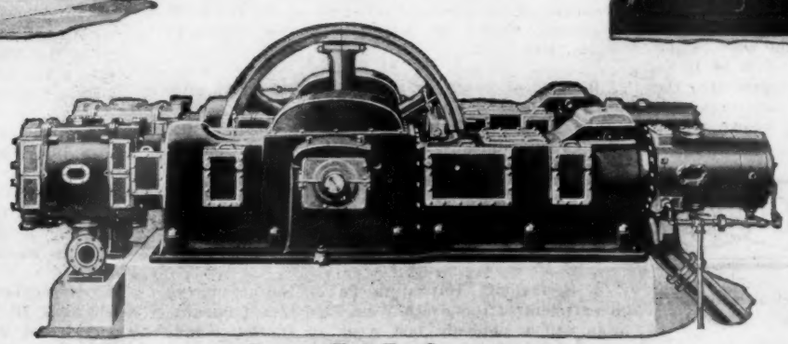


Bessemer Type Ten equipped with Gas Economizer and 8 A-2 Cylinder

Thirty years ago the first Bessemer Oil Field Engine, pictured above, entered service in the oil fields of Pennsylvania. Today over a million and a quarter horsepower of Bessemer equipment is in service the world over.



Cylinder Diesel Engine



Bessemer Type Ten Compressor—greatest value in the compressor field

BESSEMER

MEN KNOWN IN OILDOM

W. T. Holliday

To W. T. Holliday has come the honor of being the fourth president of the oil industry's oldest major oil company—the Standard Oil Company of Ohio. The first president of the company was John D. Rockefeller who headed the company's activities for many years. He was succeeded by F. B. Squire and Mr. Squire by A. P. Coombe, the latter resigning last month after 44 years of service with Standard companies, 20 of which he was president of the Standard company.

Mr. Holliday comes to the presidency from the position of general counsel of the company. He had been connected with the legal department of the company for 20 years. He was appointed general counsel in 1917, and from that time became actively associated with the company's varied activities.

Despite his long service with the one company, Mr. Holliday joins the list of younger presidents in the oil industry. He was born 44 years ago in a Cleveland suburb and his home has been in that city continuously since.

His early education was in the Cleveland schools following which he attended Adelbert College of Western Reserve University for three years. The following year he received the Bachelor of Arts degree from Cornell University. Mr. Holliday took an active interest in athletics, being a member of the football team at Western Reserve and the rowing crew at Cornell. His interest in sports continues up to the present time.

Mr. Holliday entered Harvard Law School in 1905 and graduated in 1908. He then took up law practice at Cleveland being connected with a firm representing the Standard companies. At the time of his election to the presidency of the Ohio Standard, he was a member of the legal firm of Holliday, Grossman & McAfee. He has represented the Standard interest in several of the most important cases of recent years and is widely known among the legal fraternity.

PERSONAL PARAGRAPHS

C. E. Duffield, of Redcliffe, Alberta, will leave shortly for the State of Washington.

* * *

Winston Henry has returned to Tulsa from a business trip to New York and other Eastern points.

* * *

H. L. Beatty, sales manager of the Republic Supply Company, Houston, Tex., has completed a tour of the Mid-Continent area during which he visited his company's stores in Oklahoma and elsewhere.

E. H. Leroux, president of the Oklahoma Pipe Line Company of Muskogee, Okla., visited Tulsa last week.

* * *

R. W. Laughlin, Holdenville, Okla., has returned to his office after a trip through West Texas and into Arizona.

* * *

G. Clark Gester, chief geologist of the Standard Oil Company of California, was a recent Fort Worth, Tex., visitor.

* * *

M. F. Waters, general manager of the Smith Separator Company, was a visitor in St. Louis, Mo., last week.

* * *

Roy Reynolds, consulting geologist, Fort Worth, Tex., made a recent tour through the principal active areas of West Texas.

* * *

Elmer Shock, Okmulgee, Okla., operator, is recovering from a recent illness and is spending several weeks in Fort Worth, Tex.

* * *

L. W. Bernhard has been elected secretary of Pan American Petroleum & Transport Company, succeeding the late O. D. Pennett.

* * *

A. L. Pollard, credit manager of the Louisiana Oil Refining Corporation, for the last several years, has been promoted to be assistant secretary.

* * *

James Anderson, vice president of the Humble Oil & Refining Company, has returned to Houston, Tex., following a business trip to North Texas.

* * *

W. A. Moncrief and C. E. Hyde, of the Marland Production Company, with headquarters at Fort Worth, Tex., spent a few days in West Texas.

* * *

L. R. Holmes, first assistant manager of refineries for The Texas Company, at Houston, Tex., has returned to his desk after a short business trip.

* * *

Freeman W. Burford, president, and J. J. Thomas, superintendent of the Crystal Oil Refining Corporation of Shreveport, La., spent several days in Tulsa.

* * *

A. L. Cashman, Skelly Oil Company land department, has been inspecting the Champagnolle district east of El Dorado, Ark., during the past three weeks.

* * *

T. C. Towl, Pittsburgh, Pa., superintendent of the South West Pipe Line Company, has been confined to his home for a week on account of an attack of flu.

* * *

Edgar Marston, president of the Texas Pacific Coal & Oil Company, has returned to his Fort Worth, Tex., office following a brief business trip to South Texas.

* * *

H. L. Pearson, of the W-K-M Company's pipe cleaning and handling department, spent a few days in Tulsa last week, and returned to the main office at Houston, Tex.

* * *

E. J. Bullock, vice president of the Standard Oil Company of Indiana, and president of the Dixie Oil Company, visited the latter company's offices at Tulsa, last week.

* * *

Richardson Pratt, of the Standard Oil Company of New Jersey, spent a few days in Tulsa last week, in conference with R. M. Young, president of the Carter Oil Company.

* * *

F. F. Frothingham, sales manager of the Pulmax division of the Bird Machine Company, South Walpole, Mass., has returned East after visiting West Texas and Oklahoma fields.

* * *

J. H. Redpath, Pittsburgh, Pa., of the accounting department of the South West Pipe Line Company, was called suddenly last week to Olathe, Kans., on account of the critical illness of his father.

* * *

Joseph B. Elam, secretary of the Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association, has returned to Shreveport, La., from Jackson, Miss., where he assisted the Mississippi-Alabama Oil and Gas Association in its legislative program.

B. P. Crittendon, of Shreveport, La., vice president in charge of refineries for the Louisiana Oil & Refining Company, accompanied by Mrs. Crittenden, was a visitor in Houston, Tex.

* * *

O. W. Crick, in charge of the tank car gasoline department of the Phillips Petroleum Company, has returned to Amarillo, Tex., after a business trip to Tulsa and Bartlesville, Okla.

* * *

Guy R. Holcomb, former "blue sky" commissioner of the State of Texas and assistant secretary of state, has opened a law office in Austin, Tex., for the practice of oil and gas law and corporate organization.

* * *

W. C. Trout, vice president and general manager, Lufkin Foundry and Machine Company, is on special business in connection with the sales of its products in St. Louis, Mo., Chicago and other points in the North.

* * *

P. C. Scullin, assistant manager of refineries for The Texas Company, with offices at Houston, Tex., has returned from a business trip to New York. Mr. Scullin recently was transferred to Houston from New York.

* * *

Frank C. Greene, chief geologist of the Skelly Oil Company, has resigned to become identified with the Roxana Petroleum Corporation's geological department at Tulsa, where he will conduct a series of geological experiments.

* * *

Mr. and Mrs. Frank M. Racher and family have returned to Petrolia, Ontario, from the Trinidad fields, where Mr. Racher has been drilling. Mr. Racher is visiting the Oklahoma and Texas fields before returning to Trinidad.

* * *

Levi Smith, president of the Big Lake Oil Company, was host to a number of San Angelo, Tex., friends and 200 employes of the Big Lake Oil Company, at a barbecue at Big Lake recently. Golf and baseball featured the entertainment.

* * *

Thomas G. Laney, research engineer of the Fisher Governor Company of Marshalltown, Iowa, has returned to that city after two weeks spent visiting the annual southwestern meter course at Norman, Okla., and a few days in Tulsa.

* * *

John J. Hill, of the Carter Oil Company's gasoline department, is back in Tulsa, after four months spent in Colombia and Venezuela, South America. Mr. Hill made a study of gasoline plant operation in both of the countries mentioned.

* * *

Joe Zeppa, secretary-treasurer of the Natural Gas & Fuel Corporation and Public Utilities Corporation of Arkansas, at El Dorado, Ark., has been transferred to Shreveport, La., as secretary of the Arkansas Natural Gas Company, of Delaware.

* * *

J. W. Van Dyke, president, and W. M. Irish, vice president of the Atlantic Refining Company of Philadelphia, have completed a tour of the West Texas fields; and conferred at Dallas, Tex., with the officials of the Atlantic Oil Producing Company.

* * *

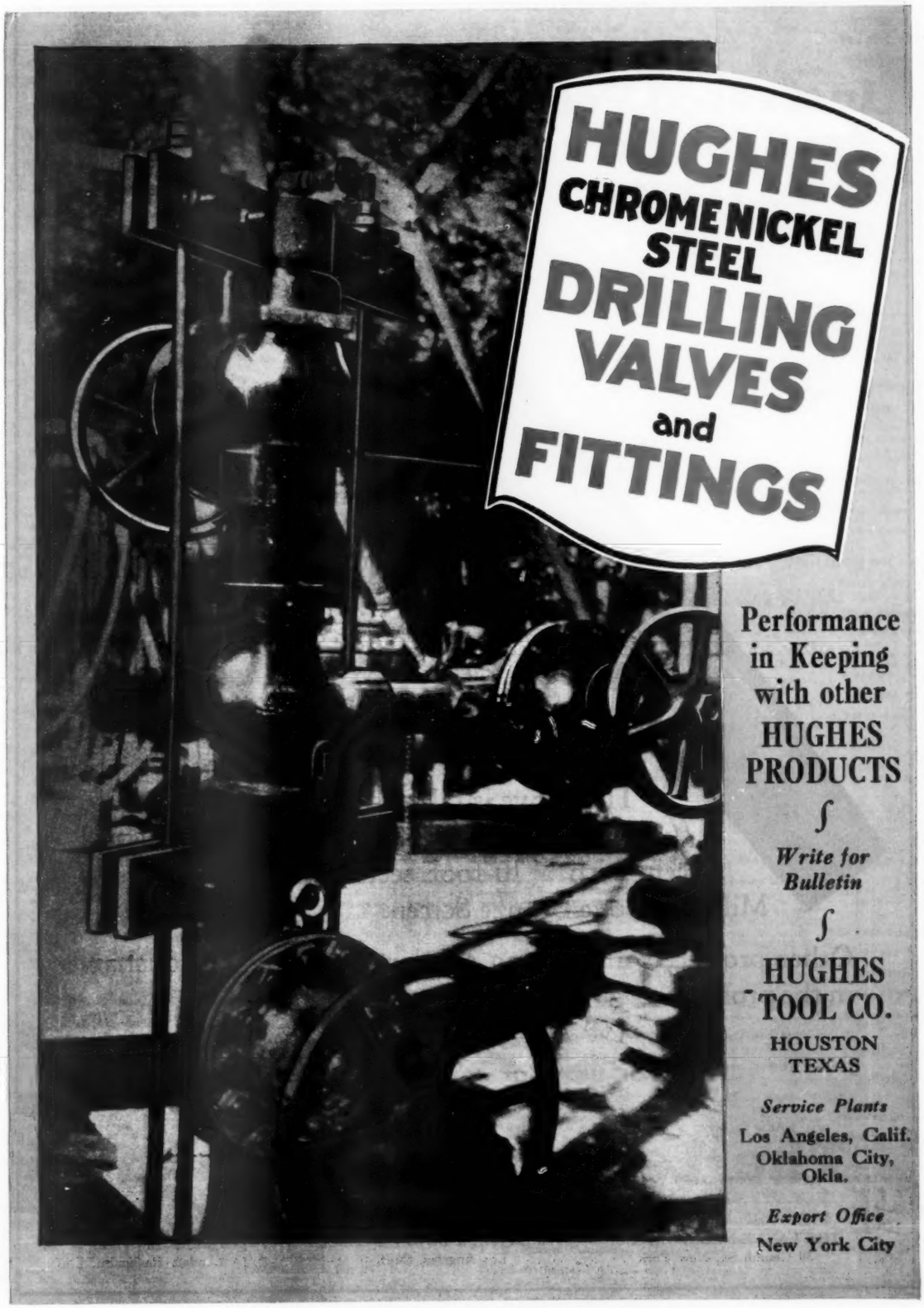
David Donoghue, chief geologist of the Texas Pacific Coal & Oil Company, and second vice president of the American Association of Petroleum Geologists, has returned to his Fort Worth, Tex., headquarters following a business trip to West Texas.

* * *

W. G. Fitzpatrick, for many years a member of the National Supply Company's sales department, has joined the Emsco Derrick & Equipment Company's sales department, and will be located at Fort Worth, Tex. Mr. Fitzpatrick was for many years in Venezuela, and was particularly well known to the tropical trade.

* * *

E. G. Seubert, Allan Jackson, R. H. McElroy, Amos Ball, R. G. Stewart and P. H. Harwood have been elected directors of Lago Oil & Transport Company, in place of George Ormsby, Elisha Walker, J. J. Cotter, F. H. Wickett, E. R. Tinker and J. Theus Munds. The same new directors of Lago Oil & Transport Company, with the exception of Amos Ball, were elected new directors of Lago Petroleum Corporation, replacing George Ormsby, J. Theus Munds, E. R. Tinker, Elisha Walker and F. H. Wickett.


HUGHES
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in Keeping
with other
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Increased Production Pays for Screen in 10 Days

"Our production has increased from 20 barrels per day to fully 50 barrels per day.

The increase in production fully paid all cost in making change in 10 days."

The above is taken from a letter written to us by a drilling contractor who replaced his old screen with a 10-foot section of the new style Milled Groove Bronze Screen.

Other producers are having similar success. Why not share in the profits?

Write or wire for complete information

The Layne & Bowler Co.

HOUSTON, TEXAS

THE LAYNE-NEW YORK CO.
30 Church St., New York

The LAYNE & BOWLER CORP.,
Los Angeles, Calif.

VICKERS, LIMITED
London, England

WILDCAT OPERATIONS IN WEST TEXAS

(Continued from Page 48)

Henshaw and McMan Oil & Gas Co.'s No. 1 W. Owens, C NW Sec. 17, Blk. G.G., G.C.&S.F.R.R. Sur. ..... Top salt 1,140 ft.; top lime 2,060 ft.; drlg. 3,725 ft.

Humble O. & R. Co.'s No. 4 L. P. Powell-B, 330 ft. each way from NW cor. NE Sec. 52, Blk. BB, G.C.&S.F. ... Location.

Renee Oil Co.'s No. 1 University, C N 40 acres of E 80 acres of SE Sec. 8, Blk. 47, Univ. Land ..... Building rig.

Republic Prod. Co.'s No. 1 L. B. Powell-B, Sec. 52, Blk. BB, G.C.&S.F. Sur. ..... Rigging up.

Taylor-Link Oil Co.'s No. 2 Powell, 150 ft. S and W of NE cor. 14-acre lease, Sec. 52, Blk. BB, G.C.&S.F. Sur. ..... Location.

Tidal Oil Co.'s No. 1 University, SE cor. SW Sec. 8, Blk. 50 ..... Rig.

Transcontinental Oil Co.'s No. 1 J. D. Atwood Est., NW cor. Sec. 7, Blk. PP, T.C.R.R. Sur. ..... Rig.

Van McPhail's No. 1 George Thompson, C 10-acre tract No. 21, Sec. 70, Blk. 1 ..... Location.

Van McPhail et al's No. 1 George Thompson, C 10-acre tract No. 22, Sec. 70, Blk. 1 ..... Location.

W. W. Donnelly & Young's No. 1 Massey, Sec. 29, Blk. U-V ..... Shut down 600 ft.

W. R. Simmons' No. 1 University, 150 feet N of C S line SE Sec. 1, Blk. 14 ..... Shut down 1,130 ft.

Whonlick's No. 1 H. M. Halff, 150 ft. N of S line and 200 ft. E of Pecos River, Sec. 69, Blk. 1, I.&G.N. Sur. ..... Drlg. 725 ft.

World Oil Co.'s No. 1 Schneeman-B, Sec. 50, Blk. BB, G.C.&S.F. Sur., elev. 2,663 ft., contract depth 2,750 ft... Top salt 1,070 ft.; hole full salt water 2,210-15 ft.; total depth 2,915 ft; rerunning 5 3-16 in. casing.

Zoch's No. 1 University, SW cor. Sec. 16, Blk. 14 ..... Shut down 250 ft.

Young & Donnelly's No. 1 J. M. Shannon, C Sec. 11, Blk. 9, D.&S.E. Sur. ..... 7,000,000 ft. gas at 1,662 ft.; shut down 1,775 ft.

Young & Donnelly's No. 2 J. M. Shannon, Sec. 18, Blk. 10, G.C.&S.F.R.R. Sur. ..... Spudded and shut down.

Young & Donnelly's No. 1 J. S. Todd, Sec. 26, Blk. WX, G.C.&S.F. Sur. ..... Fishing 600 ft.

CULBERSON COUNTY

Hickey & Stiver's No. 1 C. O. Finley ..... Total depth 1,085 ft.; set 6-in. at 1,055 ft.

Scott & Dittman's No. 1 Miller, SW cor. NW NE Sec. 1, School Blk. 97 ..... Rainbow 1,056 ft.; 300 ft. sulphur water 1,725 ft.; shut down for casing 1,767 ft.

ECTOR COUNTY

Pennsylvania Drlg Co.'s No. 1 W. E. Connell, C NE Sec. 7, Blk. B-16 ..... Location.

The Texas Company's No. 6 Cosden-Connell, NW cor. NW Sec. 10, Blk. B-16, PSL ..... Top salt 950 ft.; drlg. 1,320 ft.

EL PASO COUNTY

Sillix et al's No. 1 W. D. Malone, Sec. 46, James M. Day Sur. ..... Driving 15½-in. casing at 200 ft.

FISHER COUNTY

Cranfill & Reynolds' No. 1 T. E. Willingham, 510 ft. N and 660 ft. E of SW cor. NW Sec. 199, B.B.B.&C. Sur. ..... Location.

R. W. Raney's No. 2 Maberry, Sec. 56, Blk. 1, T.&P. Sur. ..... Drlg. 3,242 ft.

Sinclair Oil & Gas Co.'s No. 1 F. Steele, NW NE NE Sec. 72, Blk. 1, H.&T.C.R.R. Sur. ..... Top lime 1,635 ft.; underreaming 8¼-in. casing 2,585 ft.

FOARD COUNTY

Marland Oil Co.'s No. 1 J. H. Minnick, C NE Sec. 74, Blk. B, H.&T.C. Sur. ..... Drlg. 1,921 ft.

GARZA COUNTY

Latimer & Waggoner's No. 1 W. L. Cross, SW cor. Sec. 13, Blk. 4, K. Aycock Sur. ..... Location.

Marland Oil Co.'s No. 1 B. F. Pippin, C NW Sec. 1,210. W. C. Young Sur. (3,750-ft. test) ..... Top salt 960 ft.; drlg. 2,200 ft.

GLASSCOCK COUNTY

Roxana Pet. Corp.'s No. 1 Boston, Sec. 30, Blk. 34, Twp. 4-S, T.&P. Sur. ..... Rigging.

Josey & Finchbaugh's No. 1 S. R. Cox, 1,320 ft. W of NE cor. and located on the N line of Sec. 29, Blk. 33, Twp. 4s, T.R.R.R. Sur. ..... Location.

Meriwether Oil Co.'s No. 1 L. S. McDowell, CNL Sec. 34, Blk. 34, T-2-S, T.P.R.R. Sur. ..... Top salt 995 ft.; drlg. 1,665 ft.

R. R. Penn's No. 1 Hughes & Johnson ..... Location.

World Oil Co.'s No. 1 L. S. McDowell, SW SE SW Sec. 32, Blk. 34, T-2-S, elev. 2,523 ft., contract depth 3,200 ft. ..... Rigging up.

HOWARD COUNTY

I. S. Cosden & Co., Inc., No. 1 Dora Roberts, Lease A, 2,310 ft. E and 330 ft. N of SW cor. Sec. 129, Blk. 29, W.&N.W. Sur. ..... Location.

F.H.E. Oil Co.'s No. 1 Dora Roberts, SW NE Sec. 136, Blk 29, W.&N.W.R.R. Sur. ..... Pay 2,950-52 ft.; hole full oil; drlg. plug.

F. H. E. Oil Co.'s No. 2 Dora Roberts, Lease E, Sec. 136, Blk. 29, W.&N.W. Sur. (100 ft. N of No. 1-E) ..... Drlg. 1,500 ft.

Godley Oil Co.'s No. 3 A. J. Hooks, Sec. 140, Blk. 29, W.&N.W. Sur. ..... Drlg. 1,160 ft.

Godley Oil Co.'s No. 4 A. J. Hooks, Sec. 140, Blk. 29, W.&N.W. Sur. ..... Location.

Green O. & R. Co.'s No. 1 H. R. Clay, SE cor. Sec. 127 Blk 29, W.&N.W. Sur. ..... Shut down for casing 945 ft.

Henshaw et al's No. 1 W. R. Settles, SW SE SW Sec. 135, Blk. 29 ..... Top pay 2,349-60 ft.; bit in hole, shut down 2,519 ft. for orders, hole full of oil.

Lockhart et al's No. 2 Dora Roberts, Sec. 157, Blk. 29, W.&N.W. Sur. ..... Material on ground.

Magnolia Pet. Co.'s No. 7 Dora Roberts, SW NE SW Sec. 136, Blk. 29, W.&N.W. Sur. ..... Underreaming 10-in. casing 948 ft.

Magnolia Pet. Co.'s No. 8 Dora Roberts, NW SW SW Sec. 136, Blk. 29 ..... Rig.

Mays, Nixon & Flowers' No. 1 W. J. Flowers ..... Cattle salt at 976-97 ft.; top salt 1,114 ft.; shut down 2,100 ft.

Merrick & Lamb's No. 4 H. R. Clay, CSL SE NE Sec. 126, Blk. 29, W.&N.W. Sur. ..... Location.

Miley and Marland Oil Co.'s No. 1 C. D. Read, C NW Sec. 12, Blk. 31, T.&P. Sur., T-1-N ..... Spudded and shut down 5 ft.

Owen & Sloan's No. 4 Dora Roberts, Sec. 136, Blk. 29 ..... Rigging up machine 2,000 ft.

Sprague Oil Co.'s No. 1 Roberts ..... Spudded and shut down.

Sun Oil Co.'s No. 2 W. R. Settles, NW SE SE Sec. 135 Blk. 29 ..... Underreaming 12½-in. 950 ft.

Sweeney et al's No. 3 Chalk, Sec. 124, Blk. 29 ..... Location.

Sweeney et al's No. 4 Chalk, Sec. 124, Blk. 29 ..... Location.

Sweeney et al's No. 6 Chalk, Sec. 124, Blk. 129, W.&N.W. Sur. ..... Rig up and shut down.

Texon O. & L. Co. and Marland Oil Co.'s No. 2 W. R. Settles ..... Top lime 2,030 ft.; total depth 3,504 ft.; plugged back to 1,316 ft.

Texon and Marland's No. 3 W. R. Settles, C NE Sec. 140, Blk 29, W.&N.W. Sur. ..... Shut down 1,440 ft.

Texon and Marland's No. 2 W. R. Settles-A ..... Fishing for bailer 845 ft.

Weekly Oil Corp. et al's No. 1 Dora Roberts, Sec. 158, Blk. 29 ..... Top lime 2,090 ft.; oil show 2,425-38 ft.; pulling casing total depth 3,505 ft.; P.B. 1,900 ft.

HUDSPETH COUNTY

American Land Co.'s No. 1 Lockhart and Roseborough, C SE Sec. 5, School Blk. 21 ..... Shut down 260 ft.

Western States Oil Co.'s No. 1 Moore, C SE Sec. 16, Blk. 71, T.&P. Sur., T-6 ..... Drlg. 1,865 ft.

Western States Oil Co.'s No. 1 Gardner & Moseley, NE NW Sec. 12, Blk. 18 ..... Drlg. 1,965 ft.; gray lime.

IRION COUNTY

P. F. Hill's No. 1 Horney, 150 ft. S and 450 ft. W of NE cor. SW of Sec. 2, Blk. 3, H.&T.C. Sur. ..... Shut down 1,725 ft.

Kimbrough & Tuel's No. 1 J. M. Nutt, 1,920 ft. S, 200 ft. E of NW cor. Sec. 5, Gonzales Co. School Land... Shut down 310 ft.

L. P. Powell et al's No. 1 Harlan Horney, 3,130 ft. N, 1,170 ft. E SW cor. Sec. 3, Blk. 3, H.&T.C. Sur. ..... Fishing 320 ft.

S. E. Welch et al's No. 1 J. M. Nutt ..... Shut down 900 ft.

Wesley West et al's No. 1 J. D. Suggs, SE NW SE Sec. 19, Blk. 7, H.&T.C. Sur. ..... Spudded; shut down.

JEFF DAVIS COUNTY

J. K. Hughes Dev. Co.'s No. 2 Means ..... Fishing.

Humble O. & R. Co.'s No. 2 Crecencio Flores, 1,130 ft. N and 850 ft. E of SW cor. Sec. 34, Blk. 58, T.&P. Sur., Twp. 8 ..... Drlg. 4,810 ft.

JONES COUNTY

Roesser & Pendleton & Stebbins O. & G. Co.'s No. 2 G. H. Riggs, Sec. 30, W. T. Scott Sur. No. A-310 (NE of No. 1) ..... Rigging.

J. N. Sloan and others' No. 1 W. C. Bennett, NW cor. SW SE Sec. 42, Orphan Asylum Land ..... Spudded and shut down.

W. G. Stough and others' No. 1 J. P. Willis, J. C. Patterson Sur. No. 2 ..... Shut down 1,740 ft.

Texas & Wheeler's No. 1 Henry Sayles, C NE 34 acres, Sec. 3, Blk. 20, T.&P.R.R. ..... Drlg. 1,072 ft.

KENT COUNTY

J. S. Cosden & Co.'s No. 1 N. V. Bilby, Sec. 56, Blk. 98, H.&T.C. Sur. ..... Material on ground.

Marland and Texon's No. 1 Bilby ..... Top salt 610 ft.; top lime 2,160 ft.; measuring hole 2,515 ft. contract completed.

KNOX COUNTY

Deep Rock Oil Co.'s No. 1 Moore ..... Shut down 2,495 ft. for repairs.

Deep Rock Oil Co.'s No. 1 Big Four, 1,270 ft. S and 2,500 ft. W of NE cor. Sec. 21, Blk. 4 ..... Shut down 4,516 ft.; hole full water.

LOVING COUNTY

Delaware Oil Co.'s No. 1 Lockhart & Ramsey ..... Top salt 780 ft.; drlg 4,300 ft.; gray lime; base salt.

Lockhart & Co.'s No. 1 Bower & Wells, 330 ft. each way from NW cor. Sec. 92, Blk. 1, W.&N.W. Sur. ..... Location.

Lockhart Bros.' No. 2 fee, 330 ft., 3,630 ft. W SE cor. Sec. 85, Blk. 33, H.&T.C. Sur. ..... Top salt 687 ft.; drlg. 3,300 ft.

Lockhart & Co.'s No. 1-A Lepp, Sec. 85, Blk. 33 ..... Total depth 2,260 ft.; fishing for tools.

LYNN COUNTY

Elpo Oil Co.'s No. 1 Nevois, NW cor. Sec. 6, Blk. C-42, School Lands ..... Drlg. lime 2,312 ft.

Hart Oil Corp.'s No. 1 C. O. Edwards A-1 ..... Rig.

MARTIN COUNTY

Phillips Pet. Co.'s No. 1 C. C. Slaughter, SE cor. Sec. 77, Bauer & Cockrell Sur. ..... Drlg. 340 ft.

MENARD COUNTY

Carpenter & Robbins' No. 1 Kothman, NW cor. SW SW Sec. 22 ..... Shut down 600 ft.

Carpenter & Robbins' No. 2 Kothmann, 450 ft. W, 150 ft. N SE cor. SW Sec. 22, J. P. Kuhlmann Sur. ..... Location; set. 10-in. casing 370 ft.

J. C. Barnett and T. H. Drake's No. 1 Callan City Co. Ranch, Sec. 22 ..... Shut down 850 ft.

May & Clark's No. 1 Collen, Sec. 22, B.S.&F. ..... Shut down 505 ft.

Moody Oil Corp.'s No. 1 G. S. Allison, SE cor. Johann Kuhler Sur. No. 1,472 ..... Shut down 1,570 ft.

Panhandle O. & R. Co.'s No. 1 G. P. Eckardt, C SW Sec. 10, Blk. 2, T.W.N.G.R.R. Sur. ..... Spudding; shut down.

Renfro et al's No. 1 J. Davis ..... Shut down 380 ft.

Sabiens & Bevens' No. 1 F. Wilhelm, C Sec. 28, Indianola R. R. Co. Sur. ..... Shut down 100 ft.

Sorrels & Jackson's No. 1 F. Wilhelm, C NE Sec. 6, Blk. C, Brooks & Borleson Sur. ..... Shut down 40 ft.

MIDLAND COUNTY

Gholson et al's (was Orbit Oil Co.'s) No. 1 Moreland, C SE Sec. 17, Blk. 39, T.&P. Sur., T-1-S ..... Top salt 1,910 ft.; shut down 3,510 ft., contract depth.

Shoup et al's No. 1 Roy Parks ..... Drlg. 1,310 ft.; red rock.

MITCHELL COUNTY

Boehm Drilling Co.'s No. 1 Harry Hyman, C NW SE Sec. 90, Blk. 29, W.&N.W. Sur. ..... Shut down 505 ft.

California Oil Co.'s No. 8 C. M. Adams Lease No. 2, CSL NE NW Sec. 11, Blk. 28, Twp 1n, T.&P.R.R. Sur. .... Top lime 1,528 ft.; drlg. 2,925 ft. lime.

California Co.'s No. 5 Foster, Sec. 6, Blk. 29, T-1-S ..... Location.

Magnolia Oil Co.'s No. 5 Foster, Sec. 17, Blk. 29, T.&P... Top lime 1,738 ft.; total depth 3,150 ft.; dry and abandoned.

Owen & Sloan's No. 1 Brown, NE cor. Sec. 81, Blk. 26, T.&P.Sur. ..... Drlg. 165 ft.

Robert Thraves' No. 1 C. Way, Sec. 91, Blk. 27, T.&P. Sur., T-1-N ..... Total depth 2,503 ft.; shut down.

PECOS COUNTY

Alexander & Lyle's No. 1 Myrtle Sellman, C SW SE Sec. 20, Blk. Z, T.C.Ry. Sur. ..... Location.

Amerada Pet. Corp.'s No. 1 R. C. Dillon, C SW Sec. 28, Blk. 140, T.&St.L. Sur. ..... Location.

George Anderson's No. 1 University, C Sec. 11, Blk. 17.. Top salt 1,030 ft.; shut down 1,880 ft.

Batesman & Price's No. 1 Pecos River Bed, 150 ft. N and W of NE cor. Sec. 29, Blk. 13, H.&G.N. Sur. .... Drlg. 40 ft.

Benedum & Trees' No. 1 B. T. Corder ..... Shut down 494 ft.

Bob Elmore's No. 2 Holmes, SE cor. Sec. 45, Blk. 1, I.&G.N. Sur. ..... Top salt 435 ft.; shut down 1,175 ft.

Buell & Hagan's No. 1 Pryor & Wilson, Sec. 15, Blk. 5.. Top salt 1,445 ft.; shut down 2,505 ft.

California Co.'s No. 1 Mrs. M. A. Smith, Lease 2, Sec. 26, Blk 194, G.C.&S.F. Sur. ..... Total depth 1,595 ft.; plugging back to 1,577 ft.

California Co.'s No. 3 Mrs. M. A. Smith, Lease 1, 990 ft. from S line and 330 ft. from E line Sec. 37, Blk. 194, G.C.&S.F. Sur. ..... Rigging up.

Diamond Pet. Co.'s No. 1 Blackstone & Slaughter, C E half Sec. 28, Blk. A-3 ..... Drlg. 360 ft.

M. C. Dibble & Hale's No. 1 Bonebrake, Sec. 115 Blk. 8, H.&G.W. Sur., elev. 2,555 ft. ..... Shut down 1,170 ft.

Otto Oil Co.'s No. 1 J. M. Montgomery, Sec. 104, Blk. 331, A-6,387 ..... Drlg. 40 ft.

Douglas Oil Co.'s No. 2 Myrtle Sellman, Sec. 14, Blk. Z, T.C.R.R. Sur. ..... Hole full salt water 795-860 ft., 25 ft. sulphur water 1,614-15 ft.

Furman Oil Co.'s No. 1 T. W. McNear, Jr., Sec. 46, Blk. 9 ..... Moving in material.

Everett et al's No. 1 J. Fields ..... Spudded and shut down.

Kirby Pet. Co.'s No. 1 University, NE cor. Sec. 36, Blk. 24, University Land ..... Top lime 1,305 ft.; shut down 1,385 ft.

Mazda Oil & Gas Co. and Savoy's No. 2 M. A. Smith, 830 ft. S and 330 ft. E of NW cor. of their lease, Sec. 24, Blk. 194, G.C.&S.F. ..... Moving in machine.

Mid-Kansas O. & G. Co.'s No. 1 Pryor & Wilson, NW cor. Sec. 3, Blk 5, T.C.R.R. Sur. ..... Top salt 1,455 ft.; drlg. 2,710 ft. casing 2,145.

McDonald et al's No. 1 A. A. Parsell, C NW SE Sec. 28, Blk. A, G.C.&S.F.R.R. Sur. ..... Shut down 100 ft.

Phillips Pet. Co.'s No. 1 Nutt, SE cor. Sec. 8, Blk. 125 .. Shut down 450 ft.

R. J. Spikes' No. 1 George Brown ..... Shut down 700 ft.

Roxana Pet. Corp. and Kirby Pet. Co.'s No. 1 University, Sec. 23, Blk. 26 ..... Shut down 355 ft.

Southern C. O. P. Co.'s No. 1 Scharbauer Cattle Co., SW cor. Sec. 21, Blk. 134, T.&St.L. Sur. ..... Drlg. 755 ft.

Stidham & Thrasher's No. 1 Belgrade Ranch Co., Sur. 3, Mrs. S. Tompkins A-4,695 ..... Flowing sulphur water; shut down 2,020 ft.

Transcontinental Oil Co.'s No. 1 University, NE NW SW Sec. 18, Blk. 18 ..... Top lime 1,155 ft.; drlg. 2,060 ft.

Vacuum Oil Co.'s No. 1 Elsinore Cattle Co., Sec. 60, Blk. D, G.C.&S.F. Sur. ..... Drlg. 2,655 ft.

World Oil Co.'s No. 1 Kloh, Sec. 47, Blk. 45, Twp. 8, T.P.R.R. Sur., elev. 2,810 ft. ..... Run. 8-in. casing; total depth 1,235 ft.

World Oil Co.'s No. 1 Serf, C NE Sec. 10, Blk. 130, T.&St.L. Sur., elev. 3,435 ft. ..... Run. 6-in. casing; total depth 3,235 ft.

PRESIDIO COUNTY

Hadlock & Miller's No. 1 Tootle Est., Sec. 123, Blk. 3, D.&P. Sur., elev. 2,912 ft. ..... Abandoned at 3,510 ft.; hole plugged.

Phillips Pet. Co., Empire G. & F. Co., Delmar Oil Co. and C. E. Miller's No. 1 Tootle Est., C NE Sec. 75, Blk. 3, D.&P.R.R. Sur. ..... Location.

Pinto Canyon Oil Co.'s No. 1 Fields, 1,760 ft. S and E NW cor. Sec. 74, Blk. 2, D.&P. Sur. ... Location.

REAGAN COUNTY

California Oil Co.'s No. 4 University, NW cor. Sec. 3, Blk. 7 ... Top salt 1,340 ft.; total depth 3,048 ft; cmt. 8¼-in. 3,032 ft.

Moody Oil Co.'s No. 1 R. A. Walters ... Spudding and shut down.

Roxana Pet. Corp.'s No. 1 University, NW cor. Sec. 30, Blk. 11, University Lands ... Drlg. 1,130 ft.

Skelly Oil Co.'s No. 2 University, SE SW SE Sec. 35, Blk. 8 ... Drlg. 2,810 ft.

Texon O. & L. Co.'s No. 1-B University, Group 1 ... Top pay 6,250 ft.; 2,000 ft. oil. rig burned; shut down 8,220 ft.

Texon O. & L. Co.'s No. 1 University-McBurnett, 330 ft. S and E of NW cor. Sec. 11, Blk. 7, Univ. Land ... Location.

REEVES COUNTY

Exploration Co.'s No. 1 A. A. Kinney, 1,500 ft. W of NE cor. Sec. 26, Blk. C-18, Public School Land, elev. 2,847 ft. ... Drlg. 2,185 ft., anhydrite.

Grisham-Hunter Corp.'s No. 1 Rathge & Conner, 600 ft. from N line and 5,760 ft. from W line of Sec. 26, Blk. 2, E.&G.N. Sur. ... Top salt 1,037 ft; drlg. 3,650 ft.; gray lime.

David R. Thompson's No. 1 A. A. Eddins ... Shut down 5,499 ft. for casing.

Vacuum Oil Co.'s No. 1 Grisham-Hunter ... Total depth 3,648 ft.; pulling all casing; dry and abandoned.

World Oil Co.'s No. 1 A. L. Duff, 1,500 ft. from S line, 850 ft. from NE line, Johnson Sur. No. 68, elev. 2,774 ft., contract depth 4,000 ft. ... Moving in material

RUNNELS COUNTY

Agnew & Sons, Inc., No. 1 R. R. Russell, in Mrs. H. Hollien, Sur. No. 13½ ... Drlg. 920 ft.

Gibson & Johnson's No. 1 W. H. Rainwater, 660 ft. N and E of SW cor. of J. H. San Miguel Sur. (corr. location for No. 1 Harris) ... Rigging.

Jones Oil Syndicate's No. 1 W. Hale ... Shut down 2,210 ft.

McLean et al's No. 1 G. W. Clayton ... Shut down 1,050 ft.

Marland Oil Co.'s and E. L. Smith Oil Co.'s No. 1 A. C. Herring, C Sec. 121, E.T.R.R. Sur. (3,000-ft. test) ... Shut down 650 ft.

Marland Oil Co.'s No. 1 R. R. Russell, near CSL J.F.G. Sur. ... Underreaming 8¼-in. 2,190 ft.

Kennedy et al's No. 1 J. E. Tally ... Shut down 2,430 ft.

May et al's No. 1 J. M. Schneider, John Wall Sur. ... ½ bailer salt water 1,033 ft.; hole full water 1,100-20 ft.; fishing 1,775 ft.

Miles Oil Co.'s No. 1 Charles Ray, Sec. 21, T.&N.O. Sur. ... Cellar and machine.

Miles Oil Co.'s No. 1 L. S. Lawhon, NE cor. Sec. 68 ... Show gas 960-80 ft.; shut down 2,450 ft.

Royal Pet. Co.'s No. 1 A. C. Willingham ... Shut down 1,720 ft.

R. B. Summers et al's No. 1 J. W. Reese, M. J. Parramore Sur. No. 26 ... Drlg. 982 ft.

Swensondale Oil Co.'s No. 1 E. A. Werner ... Shut down 3,008 ft.

Vacuum Oil Co., Lou Ladd et al's No. 1 J. S. Flanagan NW cor. Subdivision No. 29, Domingo Diaz Sur. No. 532 ... Drlg. 240 ft.

Vacuum Oil Co. et al's No. 1 H. B. Fowler, Subdivision No. 23, Domingo Diaz Sur. No. 532 ... Drlg. 1,759 ft.

Watchorn O. & G. Co.'s No. 1 J. L. King ... Top gas 3,475 ft.; 3,000,000 ft. gas; drlg. 3,479 ft.

SCHLEICHER COUNTY

Beavers & Leath et al's No. 1 J. A. and W. T. Whitten, C NW Sec. 35, Blk. 11, T.O. Sur. ... Shut down 400 ft.

J. F. Long and O. C. Long's No. 1 W. H. Williams, NE cor. Sec. 28, H.E.&W.T.R.R. Sur. ... Rigging cable tools

SCURRY COUNTY

J. B. Mims et al's No. 1 J. J. Koonsman, Sec. 216, Blk. 2, H.&T.C. Sur ... Rig

STERLING COUNTY

Manhattan Oil Co., Hucony Gas Co. et al's No. 1 Elwood, 2,640 ft. W. 250 ft. N SE cor. Sec. 14, Blk. 2, H.&T.C. Ry. Sur. ... Building rig.

Orr et al's (to be taken over by Empire G. & F. Co.) No. 1 Neal Reed, CNL Sec. 15, Blk. 30, W.&N.W. Sur. ... Shut down 1,390 ft. (corr.)

STONEWALL COUNTY

Henshaw Oil Corp.'s No. 1 W. P. Moore, Sec. 136, Blk. 1, H.&T.C. Sur. ... Set 12½-in. 1,260 ft.; drlg. 1,270 ft.

SUTTON COUNTY

J. D. Nantz et al's No. 1 G. Allison, C NE Sec. 29, Blk. B, H.E.&W.T.R.R. Sur. ... Shut down 120 ft.

National Potash Co.'s No. 1 J. N. Ross ... Shut down shale 1,329 ft

TAYLOR COUNTY

Dorning & Perrine's No. 1 J. A. Hammer, C N 100 acres, Sec. 23, Blk. 19, T.&P. Sur., elev. 1,904 ft. ... Shut down 455 ft.

Gilbert Johnson and Day Bros.' No. 1 C. M. Brown, Sec. 1, Blk. 6, T.&P. Sur. ... Hole full water 2,170-2,220 ft.; cased off; shut down 2,003 ft., contract depth.

TERRELL COUNTY

Big Bend Oil Co.'s No. 1 Bassett ... Location.

Champlin Ref. Co.'s No. 1 Corder, C Sec. 110, Blk. 1, C.C.S.D. Sur. ... Drlg. 2,520 ft.

Deep Rock Oil Co.'s No. 1 H. C. Nolke, Sec. 4, Blk. A-2, T.C.R.R. Sur. ... Drlg. 2,425 ft.

Humble Oil Co.'s No. 1 University, Sec. 15, Blk. 24 ... Drlg. 3,235 ft.

Koch Pecos Trust Co.'s No. 1 Hamilton, C Sec. 6, Blk. D-7, E.L.&R.R. Sur. ... Rig.

Milham Exploration Co.'s No. 1 Bassett, Sec. 77, Blk. Y, W. E. Robertson Sur. ... Drlg. 2,409 ft.

Woodley & Jones' No. 1 Pankenham, C SE NW Sec. 43, Blk. B-2, C.C.S.D.R.G.&N.G.R.R. Sur. ... Rig.

TERRY COUNTY

Kingsland O. & P. Co.'s No. 1 Brownfield, C NW SW SW Sec. 7, Blk. 1-A, E.L.R.R. Sur. ... Shut down 4,008 ft., contract depth.

TOM GREEN COUNTY

Collins et al's No. 1 Jones, CSL Sec. 646, Shaffer Sur. ... Rig.

Cox et al's No. 1 Llano ... Shut down 845 ft.

Fitzgerald's & Taliaferro's No. 1 Bennett ... Shut down 1,955 ft.

Lone Eagle Oil Co.'s No. 1 Sharp, SE W Elzel Sur. No. 167 ... Spudded and shut down

Marland Oil Co.'s No. 1 J. W. Johnson-A ... Shut down 3,417 ft.

McLaughlin & Ridge's No. 1 R. Q. Holder, 3,140 ft. N and 80 ft. W SE cor. J. P. Parker Sur. (3,000-ft. test) ... Repairing engine 150 ft.

Tulsa Oil Co.'s No. 1 Adams, C SW Sec. 162, Blk. 11, S.P.R.R. Sur. ... Shut down 1,020 ft.

Haubelt et al's No. 1 Johnson ... Shut down 1,205 ft.

World Oil Co.'s No. 1 Mrs. F. T. March ... Location.

UPTON COUNTY

Mark Curtis et al's (was Hults et al's) No. 2 Giddings, 5,336 ft. S and 6,678 ft. E of NW cor. Throckmorton Co. School Land, League 1, elev. 2,757 ft. ... Shut down 975 ft.

Penn and Atlantic's No. 1 Live Stock Exchange, Sec. 34, Blk. 38 ... T.S. 1,590 ft.; drlg. 2,215 ft.

The Texas Company and Cordova Union's No. 1 Union Land, Sec. 23, Blk. 35, H.&T.C. ... Top pay 2,098 ft.; swabbed 60 bbls. in 36 hrs. at 2,271 ft., 2 per cent water; 2,200 ft. sulphur water 2,390-2,405 ft.; total depth 2,201 ft.; plugged back to 2,350 ft. and lost bailer; fishing.

Wise & Jackson's No. 1 J. H. Porter, SW cor. SW SW Sec. 184, Blk. E, elev. 2,592 ft. ... Top pay 2,419 ft.; total depth 2,517 ft., gray lime; shut down.

VAL VERDE COUNTY

A. Blume et al's No. 1 Moore Est., Sec. 183, J. Mitchell Sur., elev. 953 ft. ... Shut down 3,000 ft.

Curse Williams' No. 1 Holman, NE NE Sec. 5, Blk. N, G.H.&S.A. Sur. ... Shut down 2,940 ft.

East Del Rio Oil Co.'s No. 1 Russell, SE cor. Sec. 153, Del Rio Town Sur., elev. 941 ft. ... Shut down 3,320 ft.

Magnolia Pet. Co.'s No. 1 Whitehead, Sec. 81, D.G.C. &S.F. Sur., elev. 1,770 ft. ... Preparing to plug 6,725 ft.

Independent Operators' No. 1 Whitehead, SE SE Sec. 80, Blk. 4, I.G.&N. Sur., elev. 1,175 ft. ... Shut down 3,900 ft.

O. O. Owens' No. 1 Mills, Sec. 128, Blk. 1, L.&G.N. Sur., elev. 2,130 ft. ... Gas sand 2,491-2,[illegible] ft.; tested 125,750 ft.; gas; set 8-in. 2,511 ft.; shut down 4,[illegible] ft.

W. B. Thraves et al's No. 1 W. E. Wilson ... Shut down 920 ft.

WARD COUNTY

Alfredo Del Cambre's No. 1 Lee Monroe, Sec. 50, Blk. 33, H.&T.C. Sur. ... Spudded and shut down 65 ft.

Denver P. & R. Co.'s No. 1 Cherokee Land & Investment Co., 990 ft. from NEL and 2,310 ft. from SEL, Sec. 215, Blk. 24, H.&T.C. Sur. (4,000-ft. test) ... Drlg. 325 ft.

E. H. Devore et al's No. 1 Black, Sec. 214, Blk. 34, H.&T.C. Sur. ... Spudded and shut down.

Estex Oil Co.'s No. 1 W. A. Estes, C SW NE Sec. 4, Blk. B-29 (3,500-ft. test) ... Drlg. 680 ft.

Rector Oil Co.'s No. 1 State, 990 ft. from NEL and NWL, Sec. 30, Blk. 4, H.&T.C.Sur. ... Spudded and shut down

Selby Oil Co. et al's No. 1 A. G. Dooley et al, Sec. 85, Blk. A, G.M.M.&A. Sur. ... Drlg. 2,244 ft.; L.S.-R.R. anhy.

WINKLER COUNTY

Amerada Pet. Corp.'s No. 1 J. B. Walton, SW cor. NW Sec. 48, Blk. 26, elev. 2,838 ft. ... Fishing 2,502 ft.

Atlantic O. P. Co.'s No. 2 Hendricks-G, 440 ft. S. 330 ft. E NW cor. Sec. 46, Blk. 26 ... Location; rigging up rotary.

Atlantic and Collett's No. 7 Hendricks-F, Sec. 40, Blk. 26 ... Rigging up rotary.

Atlantic and Collett's No. 8 Hendricks-F, Sec. 40, Blk. 26. Location.

Atlantic O. P. Co.'s No. 2 Grisham-Hunter-E, NW cor. Sec. 41, Blk. B-5 ... Drlg. anhydrite 1,786 ft.

Atlantic O. P. Co.'s No. 3 Grisham-Hunter-E, CNL N half NE Sec. 41, Blk. B-5 ... Location.

Atlantic O. P. Co.'s and Collett's No. 3 Hendrick-F, NW NE NW Sec. 40, Blk. 46 ... Top salt 1,827 ft.; fishing 2,190 ft. (cor.).

Atlantic O. P. Co.'s No. 5 Hendricks-E, NE cor. Sec. 41, Blk. B-5 ... Drlg. 425 ft.

Atlantic O. P. Co.'s No. 1 Grisham-Hunter-C (was Lemar), SW cor. Sec. 40, Blk. B-5 ... Total depth 2,978 ft.; gas pressure split connections; est. 75,000,000 ft. gas; top salt 1,573 ft.; top lime 2,200 ft.; shut in.

Atlantic O. P. Co.'s No. 7 Hendricks-D, NW cor. SW S half NW Sec. 29, Blk. B-5 ... Drlg. 1,277 ft.

Atlantic O. P. Co.'s No. 8 Hendricks-D, SW cor. S half NW Sec. 29, Blk. B-5 ... Drlg. 1,082 ft.

Atlantic O. P. Co.'s No. 1 Hendricks-G, SW cor. NW Sec. 46, Blk. 26 ... Underreaming 401 ft

Atlantic and Collett's No. 5 Ida Hendricks-F, SE SW NW Sec. 40, Blk. 26 ... Drlg. 2,431 ft.

Atlantic and Collett's No. 6 Ida Hendricks-F, SW SE NW Sec. 40, Blk. 26 ... Drlg. 1,993 ft.

V. T. Bolin et al's No. 1 Brown ... Top salt 1,302 ft.; drlg. red rock and anhydrite 2,650 ft.

California Oil Co.'s No. 5 Hendricks, SE cor. E half NE Sec. 29, Blk. B-5 ... Top lime 2,560 ft.; top salt 1,196 ft.; top lime 2,500 ft.; top pay 2,780 ft.; total depth 3,040 ft.; plugged back 2,910 ft.; sulphur water 2,820-30 ft.; shot 120 qts. 2,820-2,900 ft.; est. 600 bbls. per day, 15 per cent b.s.

California Oil Co.'s No. 6 Hendricks, NW cor. E half NE Sec. 29, Blk. B-5 ... Top salt 1,217 ft.; top lime 2,471 ft.; top pay 2,780 ft.; cleaning out 2,990 ft.; 500 bbls. per day, 15 per cent water.

Cranfill & Reynolds' No. 1 Hendricks-D, SW NW NW Sec. 33, Blk. 26 ... Drlg. 1,364 ft.

Danciger et al's No. 1 John Sealy, SW cor. NE Sec. 93, Blk. A, G.M.M.B.&A. Sur. ... Top salt 1,085 ft.; drlg. 2,420 ft.

Gibson-Johnson and Kessler & Logan's No. 1 Daugherty, C SW Sec. 3, Blk. 74 ... Top salt 1,980 ft.; 28,000,000 ft. gas; coring 3,087 ft.

Gulf Prod. Co.'s No. 2 T. G. Hendricks, NE NW NW Sec. 34, Blk. B-5 ... Rig standing.

Gulf Prod. Co.'s No. 8 T. G. Hendricks, Sec. 34, Blk. B-5. Lost old hole; drlg. 970 ft.; red beds and sand.

Gulf Prod. Co.'s No. 9 T. G. Hendricks, Sec. 34, Blk. B-5 ... Top lime 1,837 ft.; top pay 2,82[illegible] ft.; T.D. 3,025 ft.; 2,000 ft. oil and 800 ft. wtr., plugging off wtr.

Gulf Prod. Co.'s No. 12 T. G. Hendricks, Sec. 34, Blk. B-5. Top lime 2,342 ft.; top salt 1,41[illegible] ft.; top pay 2,750 ft.; drlg. 2,926 ft.; flowing 3,200 bbls., partly pinched.

Gulf Prod. Co.'s No. 15 T. G. Hendricks, C NW SW NW Sec. 40, Blk. B-5 ... Top lime 2,233; moving in rotary 2,655 ft.

Gulf Prod. Co.'s No. 16 T. G. Hendricks, NW cor. Sec 40, Blk. B-5 ... Drlg. 775 ft.

Gulf Prod. Co.'s No. 17 T. G. Hendricks, SE cor. NE Sec. 45, Blk. 26 ... Shut down 275 ft

Gulf Prod. Co.'s No. 18 Hendricks, 440 ft. from N and 330 ft. from E lines Sec. 46, Blk. 26 ... Rigging.

Gulf Prod. Co.'s No. 19 Hendricks, 440 ft. from N and 330 ft. from W lines NE Sec. 45, Blk. 26 ... Rigging

Humble O. & R. Co.'s No. 1 Hendricks-B, NE NW SW Sec. 39, Blk. 26 ... Drlg. 189 ft

Humble O. & R. Co.'s No. 2 Hendricks-B, NW NE SW Sec. 39, Blk. 26 ... Drlg. 10 ft.

Humble O. & R. Co.'s No. 2 Hendricks-C, SE NE SE Sec. 32, Blk. 26 ... Drlg. 1,810 ft

Humble O. & R. Co.'s No. 3 Hendricks-C, SE NE NE Sec. 32, Blk. 26 ... Shut down 420 ft

Humble O. & R. Co.'s No. 4 Hendricks-C, SE cor. NE Sec. 32, Blk. 26 ... Drlg. 1,150 ft.

Humble O. & R. Co.'s No. 5 Hendricks-C, NE cor. SE Sec. 32, Blk. 26 ... Drlg. 1,100 ft.

Humble O. & R. Co.'s No. 6 Hendricks-C, NE cor. Sec. 32, Blk. 26 ... Rigging up rotary

Humble O. & R. Co.'s No. 1 J. B. Walton-B, SE cor. N half Sec. 47, Blk. 26 ... Drlg. 186 ft.

Humble O. & R. Co.'s No. 1 J. B. Walton-A, NW cor. Sec. 48, Blk. 26 ... Derrick.

Humble O. & R. Co.'s No. 3 Grisham-Hunter, Sec. 34, Blk. B-5 ... Top salt 1,362 ft.; top lime 2,15[illegible] ft.; shut down 2,898 ft.; 50,000,000 ft. gas.

Humble O. & R. Co.'s No. 9 Grisham-Hunter, NE NE Sec. 34, Blk. B-5 ... Top salt 1,310 ft.; set 6-in. casing 2,188 ft.

Humble O. & R. Co.'s No. 11 Grisham-Hunter, SW cor. W half NW Sec. 41, Blk. B-5 ... Top lime 2,497 ft.; shut down 2,884 ft.

Humble O. & R. Co.'s No. 14 Grisham-Hunter, NE W half NW Sec. 41, Blk. B-5 ... Drlg. 2,148 ft.

Humble O. & R. Co.'s No. 13 Grisham-Hunter, NW SE NE Sec. 34, Blk. B-5 ... Drlg. 2,185 ft.

Humble O. & R. Co.'s No. 7 Ida Hendricks-B, SE NW N half SE Sec. 29, Blk. B-5 ... Shut down 210 ft

Humble O. & R. Co.'s No. 8 Hendricks-B, 440 ft. N, 330 ft. E of SW cor. Sec. 29, Blk. 26 ... Rigging.

Independent O. & G. Co.'s No. 2 Grisham-Hunter, SE NW SW Sec. 34 ... Top salt 1,485 ft.; top lime 2,561 ft.; shut down 2,975 ft.

Independent O. & G. Co.'s No. 3 Vardeman-B, SE NE NW Sec. 41, Blk. B-5 ... Top salt 1,340 ft.; top lime 2,23[illegible] ft.; cleaning out 2,876 ft.

Independent O. & G. Co.'s No. 6 Vardeman-B, NW cor. E half NW Sec. 41, Blk. B-5 ... Drlg. 2,360 ft.

Independent O. & G. Co.'s No. 7 Vardeman-B, NE cor. E half NW Sec. 41, Blk. B-5 ... Drlg. 340 ft.

Independent O. & G. Co.'s No. 1 E. W. Cowden, SE NW NW Sec. 36, Blk. B-5 ... Shot with 670 qts. 2,645-3,041 ft.; made 320 bbls. first 13 hrs.

Liner Drlg. Co.'s No. 1 Seth-Campbell, NE cor. Sec. 2, Blk. B-5 ... Shut down 450 ft.

Landreth and Roxana's No. 1 E. W. Cowden-A, NW cor. Sec. 3, Blk. 12 ... Set 8-in. casing at 2,511 ft.

Landreth Prod. Co.'s No. 1 T. G. Hendricks-B, NW cor. E half NE Sec. 40, Blk. 26 ... Top salt 1,496 ft.; reaming 3,70[illegible] ft.

AUSTIN "LITTLE WONDER"

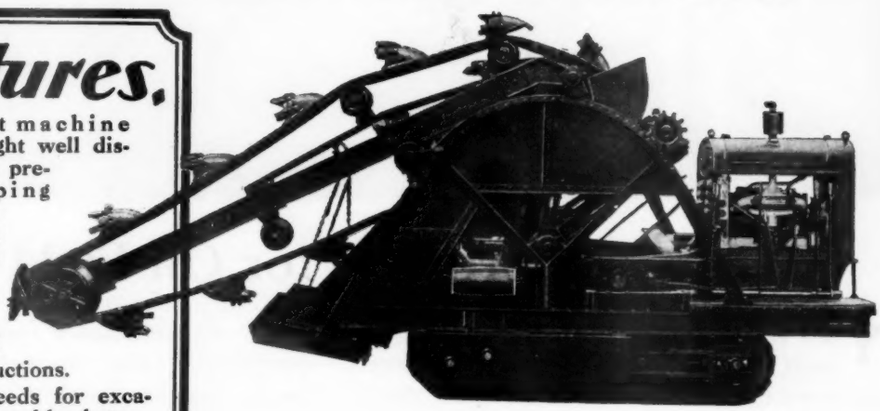
PUBLIC SERVICE DITCHER

for Digging

SHALLOW SEWERS, LATERALS, PIPE LINES GAS LINES and TELEPHONE CONDUIT

features.

1—Heaviest machine built—Weight well distributed to prevent jumping while digging and hold trench line.
2—Digs 9″ from trees, poles or other obstructions.
3—Two speeds for excavator chain and buckets.
4—Two speeds Conveyor belt.
5—Quick Shift Conveyor.
6—Boom shifts to either side of machine.
7—Positive boom crowd.
8—Only ditcher with a positive spring type bucket cleaner.
9—Only ditcher that will successfully dig sticky soil.
10—Digs 30″ wide, 8′ and 10′ deep.
11—Digs 12″ to 100″ per minute.
12—Works in confined spaces.
13—Safety factors prevent damage to machinery.
14—One man operated.



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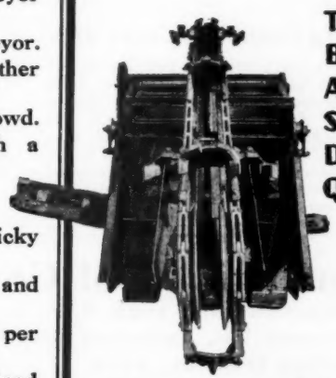
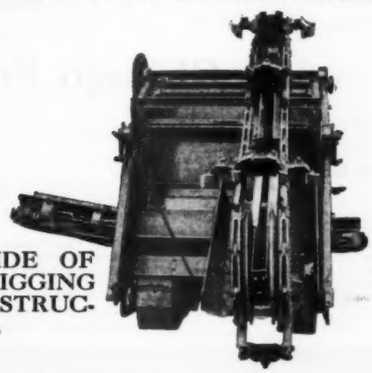


BOOM IN CENTER OF FRAME



BOOM AT SIDE OF FRAME FOR DIGGING CLOSE TO OBSTRUCTIONS.

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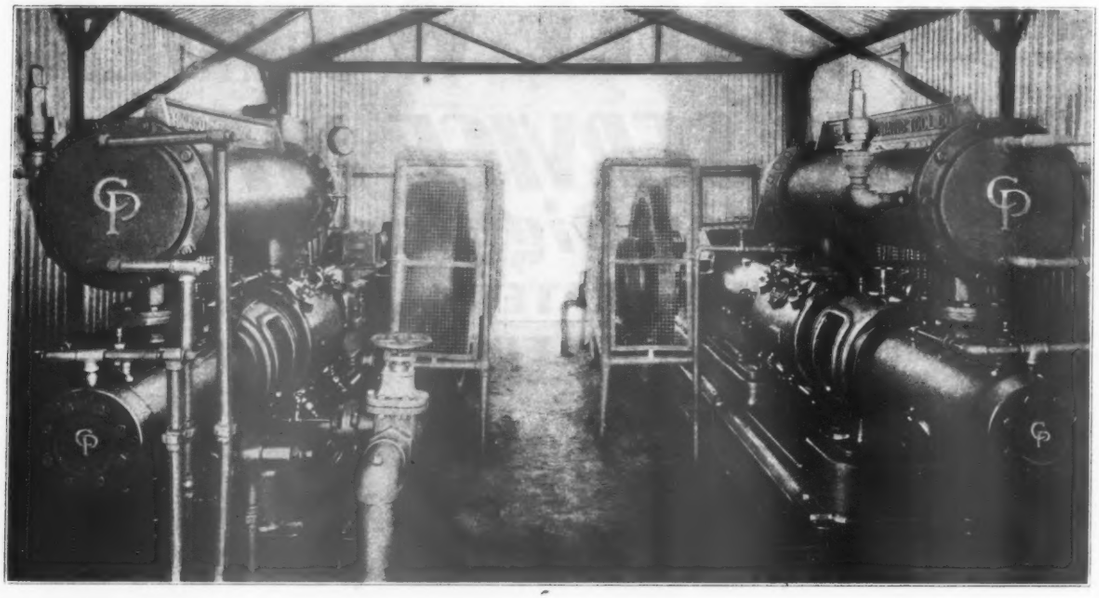

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The above installation is but one of the many CP plants in the Garber field, where encroachment of water makes swabbing difficult and extremely expensive—gas lift is effective and economical. The two CP type N-CTB Air Compressors shown above have reduced pumping costs 47% and materially increased production.

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CHICAGO PNEUMATIC AIR COMPRESSORS · BOYER PNEUMATIC HAMMERS · ROCK AND COAL DRILLS · CONDENSERS
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PAINT SPRAYERS · TOOL BALANCERS — PNEUMATIC HOISTS · SAND BLASTERS

CHICAGO *Depend upon* **PNEUMATIC** *that name*

Landreth and Roxana's No. 2 Hendricks-B, SE cor. E half NE Sec. 40, Blk. 26 ..... Drlg. 772 ft.

Landreth and Roxana's No. 5 Ida Hendricks-A, NW NE SW Sec. 29, Blk. B-5 ..... Top lime 2,620 ft.; drlg. 2,855 ft.; hole full oil 2,836 ft.

Landreth and Roxana's No. 6 Hendricks-A, NE cor. NW SW Sec. 29, Blk. B-5 ..... Top salt 1,543 ft.; top lime 2,611 ft.; drlg. 2,985 ft.

Landreth and Roxana's No. 7 Hendricks-A, NW cor. SW Sec. 29, Blk. B-5 ..... Drlg. 2,260 ft.

Landreth and Roxana's No. 1 T. G. Hendricks-C, NE NW SW Sec. 40, Blk. 26 ..... Drlg. 1,726 ft.

Landreth and Roxana's No. 2 Hendricks-C, Sec. 40, Blk. 26 ..... Building derrick.

Landreth and Roxana's No. 3 Hendricks, Sec. 45, Blk. 26 ..... Location.

Landreth Prod. Co. and Roxana's No. 2 T. G. Hendricks-C 2,200 ft. N and 330 ft. E of SW cor. Sec. 40, Blk. 26 (cor. loc.) ..... Location.

Landreth Prod. Co. and Roxana's No. 2 T. G. Hendricks-D, 440 ft. N and 330 ft. W of SE cor. Sec. 40, Blk. 26.. Location.

Landreth and Roxana's No. 1 Hendricks-D, NE cor. E. half SE Sec. 40, Blk. 26 ..... Drlg. 560 ft.

Landreth and Roxana's No. 1 Hendricks-E, SE cor. W half NW Sec. 39, Blk. 26 ..... Drlg. 161 ft.

Llano Oil Co.'s No. 1 Armstrong, common cor. Secs. 13, 12, 18, 19, Blk. B-5 ..... Location.

Marland Oil Co.'s No. 1 T. G. Hendricks, SE cor. W half Sec. 33, Blk. 26 ..... Top lime 2,373 ft.; drlg. 2,643 ft.

Marland Oil Co.'s No. 2 T. G. Hendricks, NE SE SE Sec. 33, Blk. 26 ..... Cellar.

Marland Oil Co.'s No. 3 T. G. Hendricks, NE SE SW Sec. 33, Blk. 26 ..... Top lime 2,365 ft.; top pay 2,759 ft.; made 370 bbls. first hr.; shut in for pipe line connections.

Marland Oil Co.'s No. 4 T. G. Hendricks, SW NE SW Sec. 33, Blk. 26 ..... Drlg. 1,001 ft.

Marland Oil Co.'s No. 5 T. G. Hendricks, NW NE SW Sec. 33, Blk. 26 ..... Drlg. 810 ft.

Marland Oil Co.'s No. 6 T. G. Hendricks, NE cor. SW Sec. 33, Blk. 26 ..... Drlg. 740 ft.

Marland Oil Co.'s No. 1 Hendricks-A, SE cor. Sec. 29, Blk. 26 ..... Rig.

Magnolia Pet. Co.'s No. 7 Ida Hendricks ..... Top lime 2,448 ft.; top salt 1,360 ft.; top pay 2,860 ft.; drlg. 3,028 ft.; flowed 270 bbls. 18 hrs.; shut down 3,028 ft.; water increased.

Magnolia Pet. Co.'s No. 8 Ida Hendricks ..... Top salt 1,510 ft.; top lime 2,496 ft.; show oil 2,795 ft.; total depth 2,995 ft., flowing 135 bbls. dly. 35 per cent water.

Murchison Oil Co. et al's No. 1 Grisham-Hunter-B, NE cor. SW SW Sec. 35, Blk. B-5 ..... **Top salt 1,335 ft.; shut down 2,437 ft.**

Murchison Oil Co. et al's No. 2 Grisham-Hunter-B ..... **Location.**

Mining & Engineering Co.'s No. 1 T. G. Hendricks, Sec. 10, Blk. B12 ..... **Hole full fresh water; shut down 1,282 ft.**

Murchison Oil Co. and Cranfill Bros.' No. 2 Grisham-Hunter-A ..... **Location.**

Murchison Oil Co. and Cranfill Bros.' No. 4 Grisham-Hunter ..... **Location.**

Murchison Oil Co. and Cranfill Bros.' No. 1 Hendricks-H (5-acre tract), Sec. 33, Blk. 26 ..... Top lime 2,402 ft.; mixing mud 2,565 ft.

Prairie O. & G. Co.'s No. 1 T. G. Hendricks, NW cor. E half SW Sec. 40, Blk. 26 ..... Drlg. 1,280 ft.

Prairie O. & G. Co.'s No. 2 Hendricks, Sec. 40, Blk. 26.. Rig.

Pure Oil Co.'s No. 5 Hendricks-B, SE SW SE Sec. 34, Blk. B-5 ..... **Top lime 2,420 ft.; top salt 1,412 ft.; shut down 2,762 ft.**

Pure Oil Co.'s No. 6 Hendricks-B ..... Top salt 1,315 ft.; top lime 2,388 ft.; drlg. 2,870 ft.; 30,000,000 ft. gas., 3,000 bbls. water.

Pure Oil Co.'s No. 7 Hendricks-B, NE SE SE Sec. 34, Blk. B-5 ..... Top salt 1,212 ft.; top lime 2,331 ft.; drlg. 2,731 ft.

Pure Oil Co.'s No. 8 Hendricks-B, SE NE SE Sec. 34, Blk. B-5 ..... Top salt 1,479 ft.; top lime 2,291 ft.; drlg. 2,562 ft.

Pure Oil Co.'s No. 9 Hendricks-B, NW NE SE Sec. 34, Blk. B-5 ..... Top salt 1,240 ft.; top lime 2,278 ft.; shut down 2,545 ft.

Pure Oil Co.'s No. 10 Hendricks-B, NE NW SE Sec. 34, Blk. B-5 ..... Top lime 2,322 ft.; drlg. 2,692 ft.

Pure Oil Co.'s No. 11 Hendricks-B, SW NW SE Sec. 34, Blk. B-5 ..... Top lime 2,404 ft.; rigging cable tools 2,399 ft.

Pure Oil Co.'s No. 12 Hendricks-B, NW SW SE Sec. 34, Blk. B-5 ..... Top lime 2,420 ft.; shut down 2,840 ft.; flowing 20 bbls. per hr. drlg. 2,844 ft.

Pure Oil Co.'s No. 13 Hendricks-B, NW SE SE Sec. 34, Blk. B-5 ..... Top lime 2,395 ft.; rigging up cable tools 2,397 ft.

Pure Oil Co.'s No. 14 Hendricks-B, NE SW SE Sec. 34, Blk. B-5 ..... Rig.

Pure Oil Co.'s No. 15 Hendricks-B, SE NW SE Sec. 34, Blk. B-5 ..... Material on ground.

Pure Oil Co.'s No. 16 Hendricks-B, SW NE SE Sec. 34, Blk. B-5 ..... Material on ground.

Pure Oil Co.'s No. 1 Grisham-Hunter-C ..... Top lime 2,295 ft.; total depth 2,701 ft.; top pay 2,690 ft.; initial prod. 1,054 bbls. per hr. pinched.

Pure Oil Co.'s No. 2 Grisham-Hunter-C, SW cor. SE Sec. 45, Blk. 26 ..... Drlg. 1,678 ft.

Pure Oil Co.'s No. 3 Grisham-Hunter-C, SE cor. Sec. 45, Blk. 26 ..... Drlg. 1,154 ft.

Pure Oil Co.'s No. 4 Grisham-Hunter-C, NE cor. SE Sec. 45, Blk. 26 ..... Shut down 596 ft.

Pure Oil Co.'s No. 6 Grisham-Hunter, NW SW Sec. 41, Blk. B-5 ..... Top salt 2,015 ft.; top lime 2,550 ft.; shut down 2,554 ft.

Republic Prod. Co.'s No. 1-A Grisham-Hunter-B, SW cor. E half SE Sec. 41, Blk. B-5 ..... Top salt 1,240 ft.; top lime 2,135 ft.; total depth 2,305 ft.

Republic Prod. Co.'s No. 3 Grisham-Hunter-B, NE cor. SE Sec. 41, Blk. B-5 ..... Top salt 1,380 ft.; top lime 2,340 ft.; top pay 2,929 ft.; total depth 2,951 ft.; flowed 965 bbls. first 13 hrs.; now pinched to 190 bbls. dly., 2 per cent wtr.

Republic Prod. Co.'s No. 2 Hendricks-A, NE E half SW Sec. 45, Blk. 26 ..... Top salt 1,240 ft... top lime 2,135 ft.; fishing 2,302 ft.

Republic Prod. Co.'s No. 3 Hendricks-A, SW NE SW Sec. 45, Blk. 26 ..... Cemented 15½-in. 396 ft.

Republic Prod. Co.'s No. 4 Hendricks-A, SW cor. E half SW Sec. 45, Blk. 26 ..... Drlg. 410 ft.

Republic Prod. Co.'s No. 1 Hendricks-C, SW NE NE Sec. 42, Blk. B-5 ..... Standardizing 2,708 ft.

Republic Prod. Co.'s No. 2 Ida Hendricks-C, Sec. 42, Blk. B-5 ..... Mixing mud 1,500 ft.; lost returns.

Republic Prod. Co.'s No. 3 Hendricks-C, NW SE NE Sec. 42, Blk. B-5 ..... Derrick.

Sid Richardson, Frank Kelsey and White Eagle O. & R. Co.'s No. 1 Stockton Cattle Co. (O'Brien), 330 ft. S and W of NE cor. Sec. 50, Blk. F, G.M.M.B.&A. Sur. ..... Location.

Roxana Pet. Corp.'s No. 4 Hendricks-B, NE cor. SW S half SE Sec. 39, Blk. B-5 ..... Top salt 1,500 ft.; total depth 2,965 ft.; drlg. 3,004 ft.

Roxana Pet. Corp.'s No. 5 Ida Hendricks-B, SE cor. SW S half SE Sec. 39, Blk. B-5 ..... **Top salt 1,530 ft.; top lime 2,660 ft.; total depth 3,000 ft.; tearing down rotary; top pay 2,948-70 ft.**

Roxana Oil Corp.'s No. 6 Hendricks-B, SE cor. Sec. 39, Blk. B-5 ..... Drlg. 2,655 ft.

Roxana Pet. Corp.'s No. 8 Hendricks-C, SW cor. N half NW Sec. 29, Blk. B-5 ..... **Top salt 1,555 ft., top lime 2,918 ft.; total depth 3,022 ft.; P.B. to 2,955; to test.**

Roxana Pet. Corp.'s No. 4 Grisham-Hunter-D, NE cor. S half NE Sec. 41, Blk. B-5 ..... **Top salt 1,230 ft.; top lime 2,260 ft.; fishing 2,795 ft.; flowing 400 bbls.**

Roxana Pet. Corp.'s No. 5 Grisham-Hunter-D, SE SW NE Sec. 41, Blk. B-5 ..... Rigging up.

Roxana Pet. Corp.'s No. 6 Grisham-Hunter-D, SW SE NE Sec. 41, Blk. B-5 ..... Moving in rig.

Roxana Pet. Corp.'s No. 1 Grisham-Hunter-E ..... Shut down 2,825 ft.

Roxana Pet. Corp.'s No. 1 Hendricks-F, NW cor. SW Sec. 46, Blk. 26 ..... Drlg. 915 ft.

Roxana Pet. Corp.'s No. 2 Hendricks-F, SW cor. SW Sec. 46, Blk. 26 ..... Drlg. 632 ft.

Roxana Pet. Corp.'s No. 3 Hendricks-A, Sec. 45, Blk. 26.. Building derrick.

Sheldon & Burden's No. 1 Ida Hendricks, SW cor. SE Sec. 28, Blk. B-5 (10-a. tract) ..... **Top salt 1,260 ft.; top pay 2,609 ft.; top pay 2,719 ft.; total depth 3,243 ft.; shut down 3,243 ft.**

Skelly Oil Co.'s No. 1 Hendricks, NW cor. W half NE Sec. 40, Blk. 26 ..... Set 8¼-in. casing 2,314 ft.

Skelly Oil Co.'s No. 2 Hendricks, 330 ft. W, 440 ft. S NE cor. W half NE Sec. 40, Blk. 26 ..... Rigging.

Skelly Oil Co.'s No. 3 Hendricks, SE cor. W half NE Sec. 40, Blk. 26 ..... Rigging.

Skelly Oil Co.'s No. 4 Hendricks, NE cor. W half SE Sec. 40, Blk. 26 ..... Rigging.

Skelly Oil Co.'s No. 5 Hendricks, 450 ft. N and 330 ft. E of SW cor. W half SE Sec. 40, Blk. 26 ..... Rigging.

Skelly Oil Co.'s No. 1 Hendricks-B, SW cor. E half NW Sec. 39, Blk. 26 ..... Rig.

Southern C. O. P. Co.'s No. 3 T-89 Grisham-Hunter-A, Sec. 35, Blk. B-5 ..... Top salt 1,180 ft.; top lime 2,360 ft.; fishing 2,600 ft.

Southern C. O. P. Co.'s No. 3 T-89-A Grisham-Hunter-A.. Top salt 1,072 ft.; top lime 2,362 ft.; reaming 2,889 ft.

Southern C. O. P. Co.'s No. 4 T-89-A Grisham-Hunter-A.. Rig.

Southern C. O. P. Co.'s No. 1 Ida Hendricks, 3-T-67-A, C SW NW NE Sec. 4, Blk. B-12, elev. 2,784 ft. ..... Top lime 2,535 ft.; top salt 1,527 ft.; shut down 3,072 ft.; orders.

Southern C. O. P. Co.'s No. 2 Ida Hendricks, T-67-A, NE cor. SE SE Sec. 42, Blk. B-5 ..... Location.

Southern C. O. P. Co.'s No. 4 Ida Hendricks, T-67-A, SE cor. NE Sec. 42, Blk. B-5 ..... Location.

Southern C. O. P. Co.'s No. 2 Ida Hendricks 3-T-67-A ... Top salt 1,525 ft., top lime 2,800 ft.; drlg. 3,059 ft.

Southern C. O. P. Co.'s No. 3 Ida Hendricks, T-67-3-A, Sec. 4, Blk. B-12 ..... Reaming 2,637 ft.; drlg. 2,642 ft.

Southern C. O. P. Co.'s No. 1 Ida Hendricks, T-67-E, SE NE Sec. 42, Blk. B-5 ..... Fishing for tools 2,800 ft.

Southern C. O. P. Co.'s No. 2 Ida Hendricks, T-67-E, NE cor. SE NE Sec. 42, Blk. B-5 ..... Drlg. 2,477 ft.

Southern C. O. P. Co.'s No. 3 Ida Hendricks, T-67-E, SE cor. NE NE Sec. 42, Blk. B-5 ..... Location.

Southern C. O. P. Co.'s No. 4 Ida Hendricks, T-67-E, NE cor. Sec. 42, Blk. B-5 ..... Location.

Southern C. O. P. Co.'s No. 2 T-67, Ida Hendricks-F ... Top salt 1,715 ft.; drlg. 2,654 ft.

Southern C. O. P. Co.'s No. 3 Hendricks, T-67-3B, NE NW SW Sec. 33, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 3 Ida Hendricks, T-67-B, SE NE SE Sec. 44, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 4 Ida Hendricks, T-67-B, NE SE SE Sec. 44, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 5 Ida Hendricks, T-67-B, SE cor. SE Sec. 44, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 1 T-88 Ida Hendricks-C, NW cor. Sec. 28, Blk. B-5 ..... 3,000,000 ft. gas 2,665 gt., top pay 2,883-96 ft.; 600 ft. oil; fishing job 2,906 ft.; shut down for orders.

Southern C. O. P. Co.'s No. 4 Ida Hendricks, T-88-C ..... Top salt 1,290 ft.; top lime 2,528 ft.; cleaning out 3,050 ft.

Southern C. O. P. Co.'s No. 1 Ida Hendricks, T-88-G, SW SE Sec. 28, Blk. B-5 ..... Top lime 2,612 ft.; fishing 2,695 ft.

Southern C. O. P. Co.'s No. 3 Ida Hendricks, T-88-H, SW NW SW Sec. 28, Blk. B-5 ..... Top salt 1,300 ft.; top lime 2,690 ft.; drlg. 2,887 ft.

Southern C. O. P. Co.'s No. 2 Ida Hendricks, T-88-I, NE SE E half NE Sec. 30, Blk. B-5 ..... Drlg. 1,960 ft.

Southern C. O. P. Co.'s No. 4 Ida Hendricks, T-88-A, SE NE SE Sec. 44, Blk. 26 ..... Rig.

Southern C. O. P. Co.'s No. 5 Ida Hendricks, T-88-A, NE cor. Sec. 44, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 2 Ida Hendricks, T-88-I, SE NE E half NE Sec. 30, Blk. B-5 ..... Drlg. 2,015 ft.

Southern C. O. P. Co.'s No. 3 Ida Hendricks, T-88-A, NE SE NE Sec. 44, Blk. 26 ..... Drlg. 2,660 ft.

Southern C. O. P. Co.'s No. 4 Ida Hendricks, T-88-I, SE cor. E half NE Sec. 30, Blk. B-5 ..... Derrick.

Southern C. O. P. Co.'s No. 1 T. G. Hendricks, T-88-K, NE cor. Sec. 41, Blk. 26 ..... Top salt 1,706 ft.; T.P. 2,825 ft.; T.D. 2,876 ft.; 4,420 bbls. open.

Southern C. O. P. Co.'s No. 2 T. G. Hendricks, T-88-K, SE NE SE Sec. 41, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 3 T. G. Hendricks, T-88-K, NE SE NE Sec. 41, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 4 T. G. Hendricks, T-88-K, SE SE NE Sec. 41, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 5 T. G. Hendricks, T-88-K, NE SE SE Sec. 41, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 6 T. G. Hendricks, T-88-K, SE NE SE Sec. 41, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 7 T. G. Hendricks, T-88-K, NE SE SE Sec. 41, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 8 T. G. Hendricks, T-88-K, SE cor. SE Sec. 41, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 1 Hendricks, T-88-M, SW cor. SE Sec. 33, Blk. 26 ..... Shut down 2,320 ft.

Southern C. O. P. Co.'s No. 2 Hendricks, T-88-M, NW SW SE Sec. 33, Blk. 26 ..... Drlg. 1,338 ft.

Southern C. O. P. Co.'s No. 3 Hendricks, T-88-M, SE NE SW Sec. 33, Blk. 26 ..... Drlg. 1,900 ft.

Southern C. O. P. Co.'s No. 4 Hendricks, T-88-M, SE NW SW Sec. 33, Blk. 26 ..... Top salt 1,630 ft.; top lime 2,435 ft.; rigging up standard tools 2,442 ft.

Southern C. O. P. Co.'s No. 5 Hendricks, T-88-M, SW SE SE Sec. 33, Blk. 26 ..... Drlg. 555 ft.

Southern C. O. P. Co.'s No. 6 Hendricks, T-88-M, SE SW NW Sec. 33, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 7 Hendricks, T-88-M, NE SW NE Sec. 33, Blk. 26 ..... Drlg. 561 ft.

Southern C. O. P. Co.'s No. 1 E. Hutchings, T-90, NE cor. E half SE Sec. 47, Blk. 26, elev. 2,835 ft. ..... Top salt 935 ft.; top lime 2,340 ft.; fishing for stem 2,705 ft; mixing mud to run whipstock at 2,389 ft.

Southern C. O. P. Co.'s No. 1 Ida Hendricks, T-264, SE NE SE Sec. 5, Blk. B-12 ..... Location.

Southern C. O. P. Co.'s No. 5 Tract 67 Hendricks-B, 330 ft. N and W of SE cor. Sec. 44, Blk. 26 ..... Location.

Southern C. O. P. Co.'s No. 4 Hendricks Tract 88-I, 2,310 ft. S and 330 ft. W of NE cor. Sec. 30, Blk. B-5 ..... Location.

Southern C. O. P. Co.'s No. 1 Ida Hendricks Tract 88-J, 2,145 ft. N and 330 ft. W of SE cor. Sec. 30, Blk. B-5.. Location.

Texon O. & L. Co.'s No. 3 Grisham-Hunter-A, NW cor. W half SE Sec. 41, Blk. B-5 ..... Top salt 1,460 ft.; top lime 2,320 ft.; fishing 2,667 ft.; shut down 2,720 ft.; hole full water.

Texon O. & L. Co.'s No. 4 Grisham-Hunter-A, NE cor. W half SE Sec. 41, Blk. B-5 ..... Drlg. 1,132 ft.

Texon O. & L. Co.'s No. 3 Hendricks-B, SE W half SW Sec. 46, Blk. 26 ..... Top salt 1,485 ft.; rigging up standard tools 2,532 ft.

Winkler O. P. Corp.'s No. 1 T. G. Hendricks, NW cor. Sec. 21, Blk. 26 ..... Rigging rotary.

INCREASE OIL RECOVERY, CONSERVE GAS IN FIELD

(Continued from Page 38

reservoir pressure in its attempt to pour forth the oil makes up what is known as the "effective back pressure" on the sand. When the effective back pressure is raised to such a point that it equals the reservoir pressure—as by the closing of the master gate on a flowing well—production necessarily ceases. The proportion of the total possible output of a well realized at any given time in its life depends on the relation between the then effective back pressure and the existing oil-sand reservoir pressure.

Greatest Ultimate Yield

For every well at any given time in its life there exists an effective back pressure which will cause it to produce with the lowest gas-oil ratio and, therefore, most efficiently. Such operation will return to the oil producer the greatest ultimate yield of oil and gas and, therefore, what should be the greatest ultimate profit.

The problem of the oil operator is to determine what this most efficient back pressure is, and then to apply it. It cannot be calculated or determined by an engineer or other executive while sitting in his office. It must be determined largely by field experiment, applying first to each well what has been learned in experimental work on similar wells and later by regulating the particular well to obtain the lowest gas-oil ratio. In this experimental work, gas-oil ratio is the measuring stick by which the operator can judge his results from the work done on the individual well in question, or on the group of wells, the property, or the division, as the case may be. The means which California operators have found effective in obtaining proper gas-oil ratios and corresponding efficient production are described in the following sections.

Control by Co-operative Operation

Studies of California oil fields have shown that, frequently, wells with highest gas-oil ratios are near the crest of the anticline or dome, whereas wells on the flanks of the structure have low gas-oil ratios. Sometimes a high gas-oil ratio well of one operator is found next to a low gas-oil ratio well of another operator.

Except for the conflict of ownership interests, much inefficient production of gas could be prevented in many fields if it were possible to review all well records and to prescribe shutting in or drastic pinching back of all wells with high gas-oil ratios, thus obtaining the oil production of the field from low gas-oil ratio wells. This cannot be done to the best advantage, however, if the management of a field is divided among different operators, because competition, particularly between line wells, tends to prevent agreements whereby an operator will shut in an inefficient or high gas-oil ratio line well and allow a neighbor, who might be fortunate enough to have an efficient offset well, to continue producing.

Co-operative operating agreements among operators overcome, to a great extent at least, the difficulties in applying recovery efficiency measures to a field. The operation of such agreements is well illustrated by the co-operative action of operators in the Ventura Field. This field is conspicuous for extremely high gas production, which, because of limited markets, has resulted in much surplus gas. On three occasions during the past 12 months, the principal Ventura operators have agreed to prorate their oil and gas productions in order, first, to increase the efficiency of oil and gas recovery and, therefore, the ultimate oil recovery from the sand, and second to reduce the field gas surplus.

Well Data Collected

Well data collected during the first two Ventura proration programs led to the discovery of a relation between oil production rate and gas-oil ratio, which served as the groundwork for the third proration plan, which began to function in March, 1928. This relation involved a regulation of back pressures on flowing wells to cause lower gas-oil ratios.

Furthermore, evidence from the first two proration periods pointed toward a larger ultimate oil recovery if these new methods of gas-oil ratio control were applied. In the light of these findings, each Ventura operator agreed to reduce his oil production by a given percentage. The details of the proration plan of March 7, 1928, including agreements on line wells, were developed by an operators' subcommittee. After the committee agreed on equitable line well reductions, the balance of the total necessary reduction in production of each lease was taken on inside wells at option. Reductions in the production of optional wells and, so far as possible, of the line wells were made with the following principles in mind:

1. Amount of restriction that would result in the best gas-oil ratio for the well under consideration.
2. Desirability of making large reductions on high gas-oil ratio wells and smaller reductions or none in production of low gas-oil ratio wells.
3. Desirability of closing in wells that produce practically all gas and little if any oil.

This co-operative Ventura agreement resulted in the shutting in of 10,500 bbls. per day of oil production and about 40,000,000 feet per day of gas production. The success of the three co-operative agreements among Ventura operators has demonstrated that operators can by mutual agreement meet a serious situation in regard to efficient recovery of oil and gas and can accomplish results of a major character.

Control of Ratios on Individual Leases

Most oil fields are divided into many leases of differing ownership and, up to the present time, it has not been possible in townlot areas to reconcile the demands of these many owners so that a co-operative operating agreement could be established. This fact, however, should not deter a progressive operator from applying measures which would improve the recovery efficiency and, therefore, the ultimate oil production of his lease. Application of these measures by a large number of operators in California would result in adding to the oil resources of the State through greater extraction from the sands and would also reduce surplus gas, which, because of limited markets, may have to be wasted.

Back Pressure

The amount of back pressure that can be held on individual wells without resulting in migration of oil from one operator's property to another depends on such factors as the distance between wells, the character of the oil sands, and the reservoir pressure. For example, if a field has declined in production to such a point that its maximum reservoir pressure is 200 pounds per square inch, and one operator's wells are within 200 or 300 feet of his neighbor's wells, the holding of 100 pounds back pressure on the first operator's wells would probably be reflected in an increase in gas and eventually in oil production of the neighbor's wells. On the other hand, if wells are 500 or 600 feet apart and the reservoir pressure is 1,000 or 1,500 pounds per square inch, as is common in deep zones of California fields, a difference of 100 or 200 pounds per square inch in back pressure would not be enough in proportion to the reservoir pressure to cause any appreciable migration of oil from one operator's property to another. However, increased back pressure of from 500 to 700 pounds per square inch, or an amount of 200 pounds, might easily make a very great difference in the gas-oil ratio of a well, and an operator would be justified in increasing his well pressures by such an amount in order to save gas and increase his ultimate oil recovery, even though his neighbor were not far sighted enough to join in the movement.

Certain progressive operators in California are operating their properties in this manner even in the face of lack of co-operation from their neighbors. It will be found profitable on most leases, except possibly on small townlots where neighbors are producing nearby wells at practically open flow rates, to handle wells in a manner conducive to low gas-oil ratios.

Control of Individual Wells

In fields handled under co-operative operating plans, such as those at Ventura, or on fairly large single leases, operators should close in wells that produce with exceptionally high gas-oil ratios. However, if for any cause it is necessary to operate all wells on a lease, operators should experiment with individual wells in order to operate them at the lowest possible gas-oil ratios.

Handling Flowing Wells.—Practically all operators in California install tubing during the completion of a well for the purpose of flowing the well through it. This practice is strongly indorsed. The size of the tubing and the best tubing depths are matters that, theoretically, should be varied during the flowing life of a well. However, since it is not practicable to kill flowing wells to change tubing size or depth during the period when they are flowing at high pressure, it is necessary to tube wells in such a manner that they will operate satisfactorily both during the high pressure stages and later as the pressures decline and the well approaches the gas lift stage.

Experience has shown that large flowing wells which are draining oil sands of high gas pressure can be flowed most efficiently when comparatively high back pressures are held on the oil sands. For this reason, instead of tubing wells with extra large flow strings to obtain the maximum possible production during the high-pressure stage, the better policy is to tube wells which are expected to flow at a high rate with a tubing of a size that will be useful during the later flowing and gas lift periods, as for example 2½-inch.

Large Flowing Wells

Although large flowing wells will probably flow satisfactorily when tubed at some point above the top of the perforations, still these same wells will later flow more efficiently if tubed at some point below the top of the perforations. If they are so equipped at the beginning they will not be penalized during the high pressure stages, because the tubing will help to hold the necessary back pressure, but they will be equipped for efficient flowing later on.

Most California operators flow large wells against beans, which increase the effective back pressure on the oil sands. This practice is also highly recommended. Comparatively high back pressures on flowing wells are necessary in California fields as a safeguard against collapse of casing and sanding up; high back pressures also tend to prevent irregular water encroachment through porous sands or the breaking of water shutoffs. Regulated back pressures are as important in controlling gas-oil ratios as in safeguarding the mechanical features of a well. As mentioned earlier in this paper, the one really important factor in controlling gas-oil ratios is the regulation of back pressure held against the producing sand. This pressure varies throughout the life of a well, and from well to well, and can be found only by experimenting.

In the Ventura Field, where large flowing wells of high pressure and high gas-oil ratio are common, operators have learned that back pressures of as much as 1,000 to 1,200 pounds per square inch are conducive to lowest gas-oil ratios. In fact, it has been established that the gas-oil ratios of Ventura wells can usually be controlled by proper adjustment of back pressures where the mechanical condition of the well makes such adjustment possible.

Production Graph

A daily production graph for a Ventura well that had an initial production of approximately 2,200 bbls. of oil per day shows that during the first seven weeks of its life the well flowed against a 600-pound casing pressure and declined in oil production to 1,570 bbls. per day, and that the gas-oil ratio increased from 3,000 to 5,300 cubic feet per barrel. On May 4, 1927, the well was pinched back to a production of 1,000 bbls. per day, and for the ensuing four months was producing at a back pressure varying from 1,100 to 950 pounds per square inch. The gas-oil ratio—which was increasing at a uniform rate of 1,500 cubic feet per barrel each month before beaning back—actually declined for a period of three weeks and then held at a relatively steady rate until the back pressure was again reduced in September, 1927. When the back pressure was lowered, oil production increased, showing that the well had a reserve of productive capacity, but coincident with this change the gas-oil ratio rapidly increased. On October 25, 1927, the well was again beaned back, and the upward trend of the gas-oil ratio was broken. Following this the ratio declined slightly and then remained relatively uniform. Experience with this well and many others in the Ventura Field has proved that unless back pressure control is applied, the gas-oil ratios will continue to increase until in some cases they reach figures as high as 20,000 feet per barrel.

Another interesting observation in connection with the production graph which incidentally is typical of most wells in the Ventura Avenue Field, is that the immediate loss of oil production, shown by the difference between the normal decline curve and the actual production curve during the months of May to August, 1927, was nearly regained during the last four months of the year 1927. Furthermore, a projection of the original decline curve, compared with a projection of the actual production curve during the second period of control, indicates that by controlling the gas-oil ratio of this well a large gain in ultimate oil production will be obtained.

The successful results of back pressure control illustrated by these Ventura wells suggest that even in congested areas operators are not justified in flowing their wells wide open, because in so doing they not only expose the well to the danger of casing collapse or sanding up, but they waste the gas and lower the ultimate oil production. Back pressure control can be most effectively and readily applied by the use of beans in the surface flow lines, and this method is recommended to those interested in improving the efficiency of their wells.

Efficient Handling of Gas Lift Wells

Experience has shown that control of the gas-oil ratio by regulating the effective back pressure on gas-lift wells is fully as important as controlling the gas-oil ratio in natural flowing wells. Many operators have thought that the successful operation of gas-lift wells consisted in flowing them in such a manner as to obtain the greatest possible present daily oil production. Records of a number of wells show that when the gas lift is applied without regard to the degree of back pressure necessary for efficient oil recovery and only for the purpose of obtaining a large present increase in oil production, the results are usually a large increase in gas-oil ratio and a rapid decline in oil production.

In a well in the Brea Field, California, which was flowing naturally against a 1-inch bean until April 8, 1927, because the natural flow became erratic, tubing was lowered and the well flowed through casing with the gas lift. The back pressure on the oil sand was decreased from over 200 pounds per square inch to less than 140 pounds per square inch. The oil production of the well was practically doubled for a week or so. However, the gas-oil ratio increased from 3,300 to 4,400 feet per barrel, and a decline in oil production set in at a very rapid rate.

Compare this result with that obtained in a well in the Dominguez Field. This latter well was flowing naturally at the rate of 580 bbls. per day in December, 1926, but in January and February, 1927, declined at an abnormal rate, indicating the need for gas lift assistance. Two and one-half-inch tubing which had been hanging at 3,734 feet was removed and 4,207 feet of 3-inch tubing was run on February 13, 1927. The well was put on gas lift, the flow being directed through the tubing. Oil production in-

creased at once to 750 bbls. per day, which was an increase almost as large, proportionally, as that obtained in the Brea well. In contrast with the results obtained with the Brea well, the oil production of this Dominguez well continued at this high level for a period of over two months and then declined very slowly. Accompanying this change in flowing methods was a decrease in the gas-oil ratio. This well illustrates the beneficial effects that may be obtained when flowing with gas lift, provided thought is given to the control of back pressure on the oil sands. It is recommended that operators using the gas lift experiment with their wells in order to obtain the lowest possible gas-oil ratio. Although this may result in a slightly lower initial daily production with the gas lift than could be obtained by flowing a well without restraint, the small initial loss will be exceeded by the sustained production of the well later on. Different tubing depths or the use of different sized tubing, as well as the use of trap pressure, of flow beans, or of variations in volume of circulated gas, afford means of controlling gas-oil ratios in gas lift wells.

Control of Ratios in Pumping Wells

There are several thousand pumping wells in the State of California which together produce a large quantity of natural gas. With the exception of a few wells that have been subjected to experimental work, these pumping wells produce without any attempt being made to control their gas production. However, the experimental work which has been carried on indicates that many times very substantial reductions in gas production can be made by proper control of back pressures, and frequently this control can be applied without serious loss in present daily oil production, and with a resultant arrested decline which will be reflected in increased oil recovery.

Back pressure on a pumping well can be regulated either by means of a tight casinghead, making possible the holding of gas on the casing, or by means of adjusting the tubing depth. The tubing depth method of controlling gas-oil ratios may be effective, but is more difficult to apply than the holding of gas pressure on the casing, because changing tubing depth does not permit the operator to know the exact amount of change in back pressure on the sands. Also, every change of back pressure by this method involves removing the well-head fittings and actually raising or lowering the tubing. Adjustment of back pressure by means of gas pressure in the casing may be obtained simply through the operation of a valve or the use of a flow bean on the blow-off line from the casinghead. A pressure gauge on the casing gives a direct measurement of the change in back pressure.

Gas Locking of Valves

The holding of gas pressure on the casinghead frequently causes trouble through gas locking of the pumping valves, a difficulty which, unless it is detected and overcome, may result in abnormally low oil production, because the pump will not pump down the fluid that has entered the well. This causes low daily oil production because of the failure of the pump to lift steadily and because the fluid level will rise and exert a greater back pressure on the sands than that indicated by the pressure gauge on the casing. Experienced production men readily detect gas locking and correct it by means of gas anchors, by spacing the pump valves, and by other measures. However, unless this gas locking is detected and corrected, low daily oil production may lead to erroneous conclusions regarding the actual potential production of the well against a given back pressure.

A pumping well in the Dominguez Field had an extremely high gas-oil ratio. When pumping with atmospheric pressure on the casing, the well had a daily production of 45 bbls. of oil and 500,000 feet of gas. By experimenting with different casing pressures the investigators found that by holding 40 pounds per square inch pressure on the casing it was possible to produce 50 bbls. per day of oil with only 450,000 feet per day of gas. This reduced the gas-oil ratio from approximately 11,000 feet per barrel to about 8,700 feet per barrel.

The adjustment of back pressure was obtained by using a small bean in the casinghead to bleed the gas to the desired pressure. The well, being very gaseous, gave considerable trouble at first through gas locks in the pump, but this was overcome by the use of a good gas anchor and a change in tubing depth.

Application of gas-oil ratio control to a large group of pumping wells would undoubtedly result in a greatly increased ultimate oil production and a substantial reduction in gas production and, therefore, gas surplus. It is thought that this field offers exceptional opportunity to the operator who is anxious to increase his ultimate revenue.

Need for Accurate Field Data

In conducting production experiments on wells, it is essential that complete and accurate field data be gathered both before and after making any changes in operation. This work should include the actual gauging of oil, the metering of gas, and the recording of pressures, and notes on any changes in size of beans, in tubing sizes or depths, in pumps, in gas anchors, and in rate of stroke.

Unless these data are accurately recorded, any beneficial results from experimental work will probably be lost, and the operator will have no guide for further experiments.

Gas Injection and Gas Storage

The injection of gas into the oil producing formations has been practiced by several companies in various fields of the State for three primary purposes: First, for pressure maintenance to increase the oil recovery; second, for the storage of surplus gas from some outside source during summer months to be reproduced for consumption during during winter months; and, third, for the recovery of gasoline from unrecoverable oil, by circulating dry gas through the depleted portion of the sand stratum.

Dominguez Field

The best known example of gas injection for the purpose of increasing the oil recovery is being conducted by the Shell Oil Co. of California and the Union Oil Co. of California in co-operation in the Dominguez Field. These operations have now extended over a period of one and one-half years. Some 2,034,000,000 feet of gas has been injected through six wells under an average pressure of 550 pounds per square inch. Comparison of normal decline curves of certain wells, constructed on the basis of initial productions, with the actual production curves, shows clearly that the operations have resulted in a substantial increase in the recovery of oil.

Coyote Hills Field

Arrangements were made between gas distributing companies and the Standard Oil Co. of California for the storage of surplus gas during the summer of 1927 in the Coyote Hills Field. About 500,000,000 feet of dry gas, owned by the gas companies, was delivered to the oil company and injected into the formations through two wells at about 400 pounds per square inch pressure. Besides increasing the total recovery of gasoline, which will be obtained upon recovery of the stored gas, and which is considered a secondary result benefiting the oil company, the gas company will have available a gas reserve upon which to draw during the winter months.

Coalinga Field

One example of the use of gas for recovering gasoline from unrecoverable oil is provided by the Shell Oil Co. of California in the Coalinga Field. Dry gas was injected into the oil sand through one well at an average of 40 pounds per square inch pressure and recovered with approximately 1 gallon of gasoline per 1,000 feet from surrounding wells. The gasoline is undoubtedly absorbed from the oil adhering to the sand grains. These wells have been pumping for about 15 years and the fluid levels now stand far below the top of the sand stratum so that the oil production now comes from the lower and less depleted part of the sand zone. The oil production was not increased by these operations because the gas bypassed through the upper drained part of the zone. If a large volume of gas were available so that the pressure could be built up over the whole structure by filling the voids in the sand, no doubt oil production could be increased.

Practically identical operations have been conducted for the past two or three years by the Honolulu Consolidated Oil Co. in the Buena Vista Hills, Kern County.

These operations in the several areas mentioned show the feasibility of gas injection in California fields as well as its benefits through increased oil recovery and reduction of natural gas surplus, and it is believed that further application can be made with equally favorable results.

Conclusions

This paper discusses the operations of California companies which have made field experiments and practical application of methods for increasing the ultimate recovery of oil by conserving gas. It summarizes briefly the opinion of petroleum production engineers throughout the State, as follows:

1. Gas is the most important factor in oil production, and its proper control and use is vital to the operator in obtaining the greatest ultimate oil production at the least cost.

2. Best results are obtained by control of a field as a whole, which makes co-operative agreements necessary. However, much can be accomplished without such agreements by individual effort.

3. Back pressure control is the recognized means of obtaining maximum recovery efficiency, which is indicated by the amount of gas produced with each barrel of oil. The correct back pressures for flowing, gas lift, and pumping wells must be determined by experiment.

4. It is essential that accurate records be kept on well performance both before and after the application of efficiency measures.

5. Gas injection operations are practiced for three primary purposes: Increasing oil recovery, storage of surplus gas, and the absorption of gasoline from unrecoverable oil. Secondary benefits often accrue from these operations.

6. Gas-oil ratio control not only pays dividends to the operator in the long run through greater recovery of oil but also conforms to the public demand for the conservation of gas.

MOTOR FUEL MARKET STRONG IN CALIFORNIA

LOS ANGELES, Calif., May. 5.—U. S. Motor gasoline continues to be the strongest spot in the California petroleum market. While tank car prices are unchanged, a further strengthening in the domestic market is evidenced by the decreased margin offered service stations by the smaller refiners. Most of the smaller marketers have established a tank wagon price of 5 cents under the service station price. On the present basis, this is 15½ cents, including the 3-cent state tax. The demand for gasoline locally is very heavy and U. S. Motor is moving briskly. A continued stretch of pleasant weather conducive to motoring is probably responsible.

California companies marketing gasoline in Phoenix, Ariz., are forced to sell at below cost at present. It is reported that a large, independent service station, obtaining its supply from Texas, has been cutting prices for a few weeks. This practice precipitated a price war which has resulted in a toppling of the retail price of 27 cents to 17 cents. This is a very critical situation and companies are watching it for fear it may spread. It is believed to be purely a result of local conditions and probably will straighten out before long.

The export market is also strong, most California companies apparently expecting even higher prices, as they are reluctant to quote on new business.

Naturals Weak

The natural gasoline market is showing signs of weakening slightly. Gasoline manufacturers operating at Signal Hill have increased their production to the point that in some cases it exceeds the maximum called for by contracts. Surplus gasoline is accordingly thrown on the spot market and this has brought about a weakening in price for spot sales. The situation is not expected to last and is not as serious as it might be, because the present tight U. S. Motor gasoline market has made it necessary for some of the smaller distributors to buy natural gasoline and blend themselves. While the supply of natural gasoline is large, the demand is also quite good.

Figures just released by the State Board of Equalization in Sacramento show the first quarter sales upon which tax was paid is 14.76 per cent higher than in 1927. During the first three months of 1928 aggregated 251,105,568 gallons. Among the larger companies the Standards Oil Co., Shell Co., Union Oil Co., California Petroleum Corp. and General Petroleum Corp. showed an increase over the same period of last year. Richfield Oil Co., Associated Oil Co. and Pan American Petroleum Corp. showed decreases. As usual, Standard Oil Co. of California paid the larger tax.

CLOSING UP THE GAP

OIL CITY, Pa., May 7.—Northern Pipe Line Co. has started laying a 10-mile stretch of pipe line near Franklin, Pa., to complete the missing gap in connection with the movement of crude oil westward from the Atlantic Seaboard to Franklin through lines of the National Transit and Northern. National Transit will have the greatest mileage on the haul. The laying of the line will take about six weeks and after completion oil will move westward through these lines for the first time in history.

HIGH-PRICED OLD PRODUCTION

BRADFORD, Pa., May 7.—C. D. Henline of this city sold the Hamsher lease in the town of Bolivar to Fred Bucher, formerly of Knapp Creek. The lease has a daily production of 30 bbls. from 45 producing wells on its 153 acres. Three power units and stock tanks were included in the sale price which is rumored to have been around $250,000.

A. E. CULBERTSON DIES

Almon Elias Culbertson, geologist and pioneer in the development of oil fields in European Russia, died of heart disease at his residence in New York. In 1886, Mr. Culbertson went to the Caucasus and devoted years to geological research for oil and mineral deposits. He helped organize the Grozny oil fields.

Domestic Exports of Petroleum and Refined Products

	Month of March		3 Mos. Ended Mar.	
	1927	1928	1927	1928
Crude petroleum, bbls.	1,199,299	1,528,810	3,567,459	2,997,761
Crude petroleum	$2,064,120	$1,975,589	$6,470,528	$5,338,804
Total refined petroleum, bbls.	8,554,503	10,157,043	26,865,014	30,192,928
Total refined petroleum	$36,411,183	$34,636,828	$116,177,458	$102,981,026
Gasoline, naphtha, other light products, bbls.	3,123,214	3,784,488	9,987,732	10,830,735
Gasoline, naphtha, other light products	$17,958,835	$15,443,924	$60,112,887	$44,546,996
Illuminating oils, bbls.	1,342,061	1,811,424	4,370,696	5,697,445
Illuminating oils	$6,440,439	$7,172,784	$20,903,833	$23,807,726
Gas and fuel oils, bbls.	3,199,123	3,729,697	10,138,264	11,058,086
Gas and fuel oils	$3,800,306	$4,237,295	$13,066,720	$12,079,981
Lubricating oils, bbls.	877,557	816,969	2,329,474	2,571,319
Lubricating oils	$8,030,922	$7,602,090	$21,559,882	$22,092,968
Other refined petroleum, bbls.	12,548	14,455	38,848	36,353
Other refined petroleum	$180,681	$180,735	$534,136	$453,355
Paraffin wax, lbs.	28,208,447	40,141,373	81,351,470	117,886,663
Paraffin wax	$1,419,956	$1,525,063	$4,325,580	$4,448,391

WILDCAT OPERATIONS IN TEXAS PANHANDLE

(Continued from Page 47)

Danciger et als' No. 1 L. H. Webb, NW cor. NW, Sec. 62, Blk. 29, H.&G.N. Sur. — Rig.

Dillard et als' No. 1 Furney, NE cor. SE, Sec. 202, Blk. B-2, H.&G.N. Sur. — Spudding.

Delmar Oil Co.'s No. 1 F. Foster, NW cor. SW, Sec. 55, Blk. B-2, H.&G.N. Sur. — Drlg., 2,175 ft.

Edwards et als' No. 1 E. J. Case, NE cor. Sec. 183, Blk. B-2, H.&G.N. Sur. — 70,000,000 ft. gas, 2,512-2,830 ft. top G.W., 3,034 ft; 2,000 ft. oil in hole; junked hole, 3,232 ft. and S.D.

Empire G. & F. Co.'s No. 1 A. J. Dauer, NW SE SE, Sec. 236, Blk. B-2, H.&G.N. Sur. — Little spray oil, 3,010 ft; T.D., 3,013 ft; recmtng. csg.

Empire G. & F. Co.'s No. 1 Holmes, C NE, Sec. 179, Blk. 3, I.&G.N. Sur. — Drlg., 1,880 ft.

Ealick et als' No. 1 Mrs. J. A. Hopkins, NW cor. W 80 acres of SW¼, Sec. 84 H.&T.C. Sur., Blk. B-3 — Set 8-in., 2,208 ft; 6,000,000 ft. gas, 2,654-2,795 ft; cased off; show oil, 3,042-45 ft; 2,000,000 ft. gas, 3,050 ft; drlg. G.W., 3,110 ft.

Gibson Oil Corp.'s No. 9 J. B. Bowers, NE cor. Sec. 92, Blk. B-2, H.&G.W. Sur. — Fish. for 5-in. csg., 3,733 ft.

Gibson Oil Co.'s No. 1 G. Pierce, SE cor. Sec. 149, Blk. B-2, H.&G.N. Sur. — Rig.

Gulf Prod. Co.'s No. 1 M. Davidson-A, 330 ft. from S and E lines of NW cor. E half NW, Sec. 97, Blk. B-2, H.&G.N. Sur. — C.O., 3,060 ft.

Hardendorf Drlg. Co.'s No. 1 G. A. Henderson, NE E half NE, Sec. 47, Blk. 25, H.&G.N. Sur. — U.R. 8-in., 1,550 ft.

Hickory O. & G. Co.'s No. 1 Lester, SE cor. NW NW, Sec. 1, Blk. 1, A.C.H.&B. Sur. — 20,000,000 ft. gas, 2,170-2,310 ft; cmt. 6-in., 2,392 ft.

Holbrook et als' No. 1 J. E. Williams, SW cor. 40 acres, NE, Sec. 15, Blk. 1, A.C.H.&B. Sur. — Cellar.

Lefors Pet. Co.'s No. 2 J. M. Shaw, NW cor. T. Leach Sur. — Drlg. lime, 2,325 ft.

McElroy Oil Co.'s No. 1 M. B. Davis, NE cor. S 240 acres of E half, Sec. 12, Blk. 1, A.C.H.&B. Sur. — Drlg., 2,435 ft.

Majestic Oil Co.'s No. 6 J. B. Bowers, Sec. 89, Blk. 2-B — S.O., 3,700 ft; show wtr., 3,450-55 ft; drlg., 4,105 ft.

Magnolia Pet. Co.'s No. 2 J. B. Bowers, Sec. 63, Blk. B-2, H.&G.N. Sur. — Rig.

Magnolia Pet. Co.'s No. 1 E. R. Eakins, SW cor. NW, Sec. 56, Blk. 25, H.&G.N. Sur. — Location.

Magnolia Pet. Co.'s No. 1 W. Harrah, NW cor. NW, Sec. 150, Blk. 3, H.&G.N. Sur. — Drlg., 890 ft.

Meade Bros.' No. 1 B. E. Fenley, SW NW SW of S. E. Chaney Sur. — Cellar.

Operators Oil Co.'s No. 3 W. Jackson, NE NW N half NE, Sec. 88, Blk. B-2, H.&G.N. Sur. — Location.

Osborn et als' No. 1 E. E. Barrett, SE cor. NE, Sec. 111, Blk. 3, I.&G.N. Sur. — Straightening crooked hole, 2,245 ft.

Osborne et als' No. 1 J. S. Morse, SW cor. SE, Sec. 1, Blk. 26, H.&G.N. Sur. — Drlg., 440 ft.

Parker et als' No. 1 Mrs. M. Parker, 990 ft. S and W NE cor. S 360 acres, Sec. 9, E. N. Lynch Sur. — Rig.

Parker et als' No. 2 Mrs. M. Parker, 2,310 ft. from N line, 990 ft. from E line of S 360 acres, Sec. 9, N. Lynch Sur. — Bldg. rig.

Partan et als' No. 1 J. S. Morse, NW cor. N half NE, Sec. 5, Blk. 26, H.&G.N. Sur. — Rig.

Pampa Oil Co.'s No. 1 W. R. Campbell, Sec. 90, Blk. 3 — 700 ft. wtr., 3,430 ft; S.D., 3,422 ft.

Phillips Pet. Co.'s No. 4 W. Jackson, NE cor. S half NE, Sec. 88, Blk. B-2, H.&G.N. Sur. — Derrick.

Phillips Pet. Co.'s No. 3 Jackson-Riley, Sec. 88, Blk. B-2, H.&G.N. Sur. — Recmntd. 12¼-in., 1,037 ft; 6,000,000 ft. gas, 2,590-2,635 ft; cmt. 8¼-in. csg., 2,857 ft; 300 ft. oil, 3,184 ft; considerable wtr., 3,325-29 ft; S.D.

Phillips Pet. Co.'s No. 4 Jackson-Riley, SE cor. W half SW, Sec. 88, Blk. B-2 — Drlg., 2,600 ft.

Phillips Pet. Co.'s No. 1 C. Reiger-Davidson, NW cor. Sec. 87, Blk. B-2, H.&G.N. Sur. — Drlg., 2,330 ft.

Plains Drlg. Co. and Ray's No. 1 C. Chapman, SE cor. SW NW, Sec. 50, Blk. A-9, H.&G.N. Sur. — Pay, 2,775-77 ft; swbd. 68 bbls. 12 hrs; C.O.

Plains Drlg. Co.'s No. 1-B Chapman, NE cor. E half NE, Sec. 20, Blk. 1, A.C.H.&B. Sur. — Cmtd. 6-in. csg., 2,653 ft.

Plains Drlg. Co.'s No. 1-C Chapman, 990 ft. N and 330 ft. W SE, Sec. 24, J. Davidson Sur. — Drlg., 2,850 ft.

Prairie O. & G. Co.'s No. 1 W. Harrah, NE cor. N 80 acres, E 240 acres, Sec. 163, Blk. 3, H.&G.N. Sur. — Drlg., 800 ft.

Prairie O. & G. Co.'s No. 1 Worley & Reynolds, NE cor. SW NE, Sec. 61, Blk. 3, I.&G.N. Sur. — Bldg. rig.

Purple Sage Oil Co.'s No. 2 E. B. Johnson — 2,000,000 ft. gas; 200 ft. oil; fish., 2,870 ft.

Ray & Massie's No. 2 A. Chapman, SE cor. SW, Sec. 51, Blk. 25 — Drlg., 2,524 ft.

Scott & Travis' No. 1 A. Chapman, 990 ft. N and W of SE cor. N half SW, Sec. 70, Blk. 25, H.&G.N. Sur. — S.O., 2,770 ft; run. 6-in. csg.

St. Clair Oil Co.'s No. 1 C. H. Rowe — Spudded and S.D.

St. Clair Oil Co.'s No. 1 L. S. Stockton, SE cor. Sec. 35, W. R. Lee Sur. — Spudded and S.D.

Shamrock Oil Co.'s No. 1 Chapman, NE E half SW, Sec. 50, Blk. 25 — 10,000,000 ft. gas, 2,695-2,715 ft, show oil, 2,763-73 ft; 1 bailer wtr. and little oil per hr; T.D., 3,140 ft; P.B., 2,800 ft.

Shamrock Oil Co.'s No. 2 A. Chapman, NW cor. NE, Sec. 50, Blk. 25, H.&G.N. Sur. — Drlg., 2,250 ft.

Spartan Oil Co.'s No. 1 J. Hopkins — Drlg., 2,852 ft.

Sullivan Oil Co. et als' No. 1 M. Huseiby, NW cor. E half NW, Sec. 55, Blk. 25, H.&G.N. Sur. — Location.

The Texas Co.'s No. 3 J. B. Bowers — C.O., 2,830 ft.

L. R. Travis' No. 1 J. S. Morse, NE cor. N half SW, Sec. 3, Blk. 26, H.&G.N. Sur. — Cellar.

Travis et als' No. 1 A. Chapman, SW cor. Sec. 10, Blk. 26, H.&G.N. Sur. — Cellar.

Wilcox-Pampa Oil Co.'s No. 28 Worley & Reynolds, SE cor. NW NE, Sec. 61, Blk. 3, I.&G.N. Sur. — Rig on ground.

The Texas Co.'s No. 1 M. B. Davis, SE cor. NE, Sec. 3, Blk. 1, A.C.H.&B. Sur. — Spray, 150 bbls. daily from G.W., 2,715-20 ft; fish. for bit.

The Texas Co.'s No. 2 C. Thut, SE NW SE, Sec. 1, H.&G.N. Sur. — Drlg., 2,020 ft.

The Texas Co.'s No. 3 Williams, C NW, Sec. 6, Blk. 1, A.C.H.&B. Sur. — Stdzing., 1,000 ft.

Tobias Oil Corp.'s No. 1 W. H. Taylor, C NE, Sec. 10, Blk. B-2, (formerly Smallwood et als') — T.S., 765 ft; 2,000,000 ft gas, 2,405-50 ft; drlg., 2,620 ft.

HALE COUNTY

Bailey & Young's No. 1 Thomas, Sec. 1, Blk. J.K.L. — S.D., 175 ft.

Donnell Pet. Co.'s No. 3 Mullican, NW cor. Sec. 68, Blk. A-3, L&S.B. Sur. — Top pay in sandy shale, 495 ft., ½ bailer oil and 3 bailers wtr. per day; S.D., 620 ft.

Donnell Pet. Co.'s No. 1 Mullican, C, Sec. 21, Blk. B, R. M. Thompson Sur. — 300 ft. fluid in hole from 407-14 ft; S.D.

Explin. Co.'s No. 1 Goodman — S.D., 350 ft.

A. S. Mimm's No. 1 W. A. Ritcher, 700 ft. from E line and 1,200 ft. from S line, Sec. 17, Blk. X, John Glynn Sur. — S.D., 1,140 ft.

Tolbert & Simms' (was Gouldy & Stone's) No. 1 Kitteral, SE cor. NW, Sec. 65, Blk. A-3, G.C.&S.F. Sur. — S.D., 485 ft.

HALL COUNTY

Briscoe Oil Assn.'s (was Seifert et als') No. 1 Owens, C NE, Sec. 179, Blk. S-5, Dennison & Pacific Sur. — Spudded and S.D.

HANSFORD COUNTY

Caldwell et als' No. 1 J. Adriance est. — Drlg., 2,100 ft.

Oklavania et als' No. 1 Coots, Sec. 13, Blk. 45, H.&T.C. Sur. — Run. 6-in; 900 ft. wtr., 2,940 ft; S.D., 3,350 ft.

HOCKLEY COUNTY

World Oil Co.'s No. 1 Ellwood, 320 ft from N and W lines, League 7, Wilbarger Co. school lands; elevation 3,343 ft; contract depth, 5,000 ft. — S.D., 1,455 ft. to install rotary.

HARTLEY COUNTY

Amarillo Oil Co.'s No. 7 Lee Bivins "A," C NE, Sec. 7, Blk. 25, E.L.R.R. Sur. — Spudding.

Amarillo Oil Co.'s No. 8 Lee Bivins "A," 100 ft. E of CWL, Sec. 4, Blk. 25, E.L.R.R. Sur. — Spudding.

Amarillo Oil Co.'s No. 9 Lee Bivins "A," C NW, Sec. 6, Blk. 21 — Spudding.

HUTCHINSON COUNTY

Alamoso Oil Co.'s No. 2 J. M. Sanford, Sec. 83, Blk. 46, H.&T.C. Sur. — Drlg., 2,612 ft.

R. G. Barnum et als' No. 1 Garland Sanford, Sec. 78, Blk. 46 — Drlg., 1,010 ft.

Barnum & Delmar's No. 1 Johnson Bros., NW cor. E half NW, Sec. 37, Blk. Y, A.&B. Sur. — Drlg., 512 ft.

Friedman et als' No. 1 J. O. Bost, SW cor. Sec. 9, Blk. Y-2, T.T.R.R. Sur. — Drlg., 820 ft.

Gulf Prod. Co.'s No. 40, C. L. Dial et al, 925 ft. N, 463 ft. E SW cor. John W. King Sur. — Drlg. lime, 2,400 ft.

Gulf Prod. Co.'s No. 41, C. L. Dial et al, Sec. 130, Blk. Z, E.L.&R.R. Sur. — Drlg., 2,502 ft.

Harris et als' No. 1 J. Q. Bost, Sec. 10, Blk. Y-2, T.T. R.R. Sur. — 90,000,000 ft. gas; S.D., 2,895 ft.

Holmes & Quinn's No. 1 J. K. Quinn, SW cor. Sec. 9, Blk. 3, B.S.&F. Sur. — Small show oil, 3,010 ft. in lime T.D., 3,142 ft; shot with 300 qts., 3,052-3,136 ft. in lime, swbd. 10 bbls; drlg., 3,147 ft.

McKinney Gas Co.'s No. 1 F. P. Works, SW cor. Sec. 5, Blk. Y-2, T.T.R.R. Sur. — Fish., 1,865 ft.

Oil Operators Trust Co. and Marland's No. 2 J. M. Stanford-B, Sec. 82, Blk. 46, H.&T.C. Sur. — Drlg., 310 ft.

Phillips Pet. Co.'s No. 2 Garland, Sec. 77, Blk. 46 — U.R. 10-in., 2,080 ft.

Phillips Pet. Co.'s No. 12 Elva-Whittenburg, E. Tomlinson Sur. — T.A., 4,445 ft.

Phillips Pet. Co.'s No. 2 Chap, NE cor. E 80 acres of the S 160 acres of Sec. 78, Blk. 46 — C.O., 1,685 ft.

Phillips Pet. Co.'s No. 2 Land, NW cor. of E 40 acres, N 80 acres of S 320 acres, Sec. 83, Blk. 46 — Set 10-in., 1,983 ft.

Phillips Pet. Co.'s No. 5 Johnson Bros.-Dorsett, Sec. 64, Blk. 46, H.&T.C. Sur. — Rig.

Phillips Pet. Co.'s No. 6 Johnson Bros.-Dorsett, Sec. 64, Blk. 46, H.&T.C. Sur. — Rig.

Phillips Pet. Co.'s No. 14 J. A. Whittenburg, Sec. 63, Blk. 46, H.&T.C. Sur. — Rig.

Skelly Oil Co.'s No. 2 Armstrong & Byrd — Set 12-in. csg., 1,425 ft; cmtd. 10-in. csg., 1,553 ft; drlg., 2,900 ft, small show gas, 2,815-25 ft; 3,000,000 ft. gas, 3,015-50 ft; set 6-in., 3,272 ft; show gas, 3,282-84 ft; drlg., 3,315 ft.

Skyrocket Oil Co.'s No. , Mrs. R. A. Jameson — 800 ft. oil in hole from 3,146 ft, drilled to 3,130 ft; shot with 60 qts., 3,125-60 ft; bridged; no increase in oil after deepening, C.O., 3,205 ft.

Timms & Dietsch's No. 1 C. R. Garner, NE cor. W 80 A of SE, Sec. 124, Blk. 4, I.&G.N. Sur. — Drlg., 550 ft.

Wendell et als' No. 1 Johnson Bros., Sec. 1, Blk. X03 — Set 10-in. csg., 2,035 ft. and S.D. rig burned.

Winrod Oil Co.'s No. 1 E. Cooper, Sec. 3, Blk. 9, I.& G.N. Sur. — Drlg., 600 ft.

KING COUNTY

Humble O. & R. Co.'s No. 1 Pitchfork, Sec. 171, Blk. A-96, John H. Gibson Sur. — Hole full wtr., 3,375 ft; drlg. by csg., 4,035 ft.

LAMB COUNTY

Dan Freel et als' No. 1 Ellwood, CWL, Sec. 9, Blk. T, T. A. Thompson Sur. — Spudded and S.D.

LIPSCOMB COUNTY

McCorkle's No. 1 A. Barton, NE cor. SW SE, Sec. 604, Blk. 43, H.&T.C. Sur. — Wtr. in lime, 4,126-40 ft; 6-in. set 4,155 ft; 6 3/16-in. csg. set, 4,420 ft; S.D., 4,775 ft.

Ruby Oil Co.'s No. 1 C. W. Jones, NE cor. SW, Sec. 100, Blk. 43 — Show oil, 3,520 ft; T.A. 3-24-2a at 4,380 ft; drlg., 4,775 ft.

LUBBOCK COUNTY

Center Oil Co.'s No. 1 Bowles ranch — Small show oil, 1,133-40 ft. in sand; fish., 2,730 ft.

MOORE COUNTY

Amarillo Oil Co.'s No. 1 Thompson-Amarillo, C, Sec. 23, Blk. 26, E.L.&R.R. Sur. — Cmtng. 12-in. csg., 1,320 ft, Ch. 10-in., 2,510 ft.

Amarillo Oil Co.'s No. 1 J. T. Sneed, Jr., C W 640 A, Horace Hall Sur. — Rig.

Amarillo Oil Co.'s No. 1 D. P. Seay, C, Sec. 35, Blk. 2, G.&M. Sur. — Drlg., 1,135 ft.

Amarillo Oil Co.'s No. 1 L. H. Crawford, C SE, Sec. 26, Blk. P. M., E.L.R.R. Sur. — Fish. for bailer, 1,200 ft.

Prairie and Shamrock's No. 2 Gober, Sec. 16, Blk. M-21 — T.D., 2,520 ft; recmtd. csg., 2,338 ft.

MOTLEY COUNTY

Explin. Co.'s No. 1 Burleson — Spudded and S.D.

Explin. Co.'s No. 1 Tillison — S.D., 750 ft. for repairs.

Explin. Co.'s No. 2 Matador Land & Cattle Co., C SW, Sec. 37, John Gibson Sur. — S.D., 1,245 ft.

Explin. Co.'s No. 3 Matador Land & Cattle Co., C SE, Sec. 21, Blk. O-2, W.T.R.R. Sur. — Rig on ground.

Matador Oil Corp.'s (formerly Wheeler et als') No. 1 C. D. Bird, SW cor. NW, Sec. 4, Blk. S, Stephens Sur. — Fish., 555 ft.

OCHILTREE COUNTY

W. G. Burton's No. 1 Strickler — S.D., 4,010 ft.

POTTER COUNTY

Amarillo Oil Co.'s No. 1 Masterson-K, C SW, Sec. 35, Blk. O-18, D.&P.R.R. Sur. — Recmtng. 12¼-in. csg., 1,000 ft, show gas, 1,650 ft; T.D., 2,445 ft; S.D; 10,000,000 ft. gas showing little wtr., 1,650-60 ft. and 2,215-90 ft; run. 6-in., 2,440 ft drlg., 2,910 ft.

Amarillo Oil Co.'s No. 2 Fuqua, C NW, Sec. 18, Blk. 6, B.S.&F. Sur. — Cmtd. 8¼-in. csg., 3,194 ft.

Amarillo Oil Co.'s No. 6 Lee Bivins-A, NW cor. NW, Sec. 32, Blk. B-11, E.L.R.R. Sur. — Drlg., 550 ft.

Amarillo Oil Co.'s No. 1 Lee Bivins-E, C NW, Sec. 37, Blk. O-18, D.&P.R.R. Sur. — Rig.

ROBERTS COUNTY

Big Bend Oil Co.'s No. 1 Mrs. H. Ledrick & Sons, Sec. 7, Blk. 5-A — Show gas, 4,990 ft; show oil, 4,992 ft; csg. set, 4,993 ft; T.D. 5,153 ft; set 3-in., 5,155 ft; S.D. 5,240 ft.

SWISHER COUNTY

Adams & Pritchard's No. 1 Crawford, Sec. 39, Blk. W-1, T.T.R.R. Sur. — S.D., 440 ft.

WHEELER COUNTY

Angus et als' No. 1 T. Trostle, C NE NW, Sec. 90, Blk. 17, H.&G.N. Sur. — Run. 10-in. csg., 1,185 ft.

Byrens et als' No. 1 Johnson, SW cor. NE, Sec. 33, Blk. A-5, H.&G.N. Sur. — Drlg., 1,210 ft.

Chapman & Morgan's No. 1 Otis Hatcher, NW cor. SW SE, Sec. 63, Blk. 17, H.&G.N. Sur. — Drlg., 200 ft.

Clark et als' No. 1 Mrs. J. Purcell, C NW SW, Sec. 52, Blk. 17, H.&G.N. Sur. — Rig on ground.

Rook et als' (was Foster et als') No. 1 S. H. McDonald, SE cor. NW SW, J. N. Lindsay Sur. — T.L., 3,040 ft; drlg., 3,810 ft.

L. W. Rook's No. 1 M. Nelson, C SW NE, Sec. 5, Blk. 24, H.&G.N. Sur. — Spud.

L. W. Rook's No. 2 A Smock, C SW SE, Sec. 5, Blk. 24, H.&G.N. Sur. — Rig.

Vaughn et als' No. 1 B. Woodley, C SW NW, Sec. 21, Blk. 24, H.&G.N. Sur. — Rig.

Vaughn et als' No. 1 A. Wood, C NW SW, Sec. 21, Blk. 24, H.&G.N. Sur. — Location.

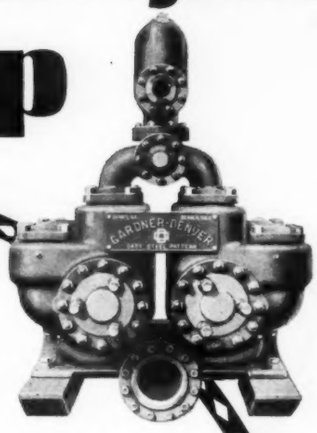
Kaufold et als' No. 1 E. R. Wallace — S.D., 890 ft.

Wischkamper's No. 1 Brown-Young, C NW NE, Sec. 55, Blk. 23, H.&G.N. Sur. — Cellar.

Wischkamper's No. 1 Gooch-Close, Sec. 81, Blk. 23, H. &G.N. Sur. — Spud and S.D.

Pete Woodley's No. 1 J. Boyle — Show gas, 1,700 ft; run. 8-in., T. D., 3,217 ft; 1,000 ft. oil and considerable wtr., 2,173 ft; show oil, 2,238-40 ft; 500 ft. wtr; to ream 8-in. csg.

The World's Largest Mud Pump



MODERN drilling methods and deep holes require the handling of large volumes of mud at high pressures. The Gardner-Denver 14½x7¼x20-inch Divided Cylinder Booster Pump for slush and oil line service offers the largest mud capacity of any mud pump ever built, and provides for a working pressure of 1500 lbs.

Heavy, rugged construction, fluid cylinders of cast *steel*, the divided pattern fluid end, and the slower 20-inch stroke of this pump, are all features that promote long life and economy. Ask for bulletin P-33 giving detailed information.

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International Supply Co., Stores in all Principal Mid-Continent Fields.
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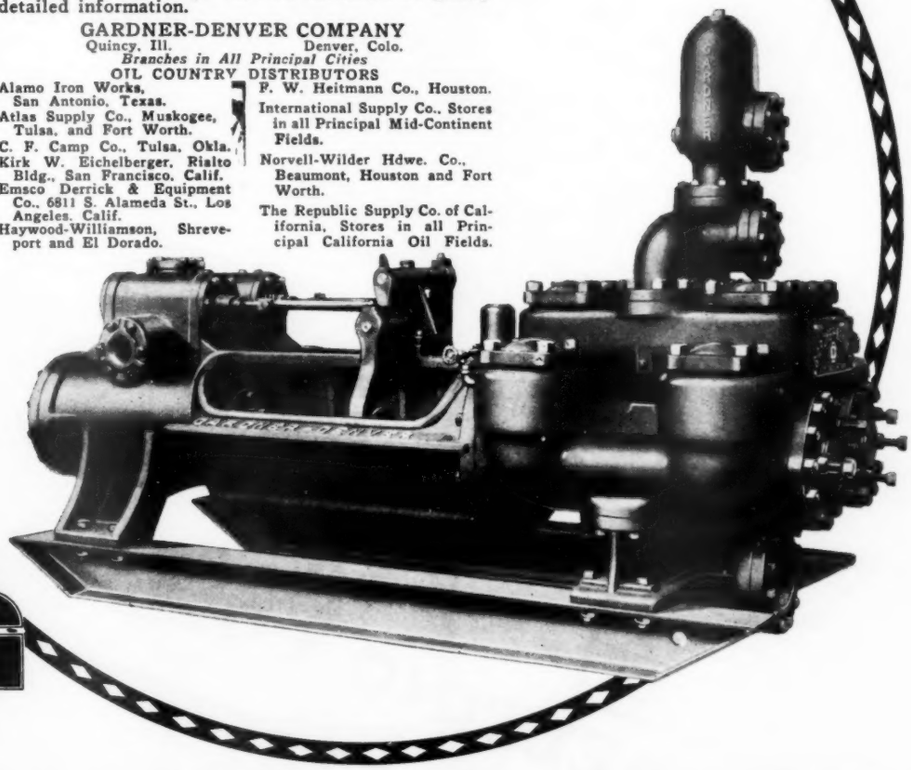


GARDNER-DENVER

O AND G

48,962 feet of hole!

This outstanding footage of "gas-well" drilling was made by an O & G—12", 8 ply, fabric BELT, purchased in the fall of 1923. *In almost continuous service of over 4½ years.* We could say a lot more about it—but what G. T. Ray & Son Gas Co., of Hamlin, W. Va., say about its work is enough said—

"This belt has given such excellent service that we believe you would be interested to know just what it has done. In addition to such fishing and handling of casing as it did in connection with the wells it was on, it has drilled 48,962 feet of hole. The work was all done in the gas end of this field. In addition should add that it was 'rawhided' about the field and has been exposed to all kinds of weather conditions (and it's certainly tough down here in West Virginia). Had it been well cared for it would undoubtedly have given more service."

O & G BELTS are made of an exclusive Imperial fabric —double stitched—innerlocked construction—and specially impregnated. They retain full flexibility thru-out their life—hug the pulleys and deliver full power—years of service, as noted above, is proof of their tough and rugged nature.

Stock is carried in all fields by the "Oil Well" Stores.

IMPERIAL BELTING CO.—CHICAGO, ILL.

Manufacturers of High Grade Fabric Belts

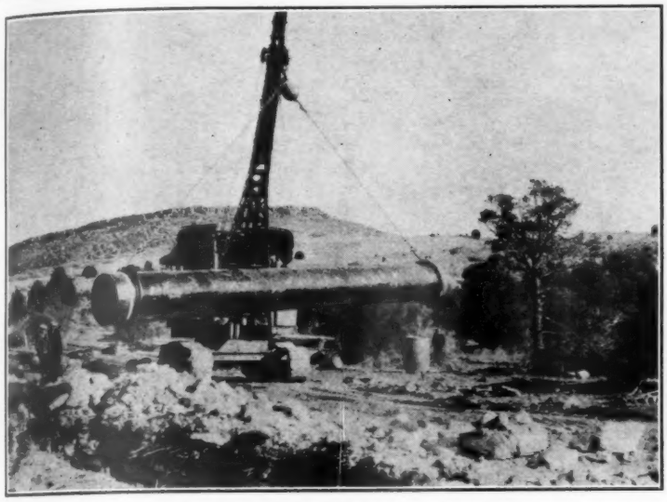
BELTS

A MAJOR ENTERPRISE IN NATURAL GAS

(Continued from Page 82)

sible to produce a better grade of steel by a uniform control of the heat.

With a market assured for the base load, the next step was to arrange for the marketing of gas in the cities and towns which would be served by the proposed line. The Public Service Co. of Colorado, a subsidiary of the Cities Service Co., is the local distributor of manufactured gas in Denver, and controls the Pueblo Gas & Fuel Co., the local utility company serving Pueblo. The City of



Pipe crane handling pipe at top of canon.

Colorado Springs owns its municipal plant. The joint interests proposing to build the pipe line made tentative contracts with the Public Service Co. under which it was agreed to wholesale the gas to the company for local distribution.

Franchise Requirements

The distributors then undertook the necessary adjustment of franchise requirements which would make it possible to substitute natural gas for manufactured gas. The voters of Denver granted

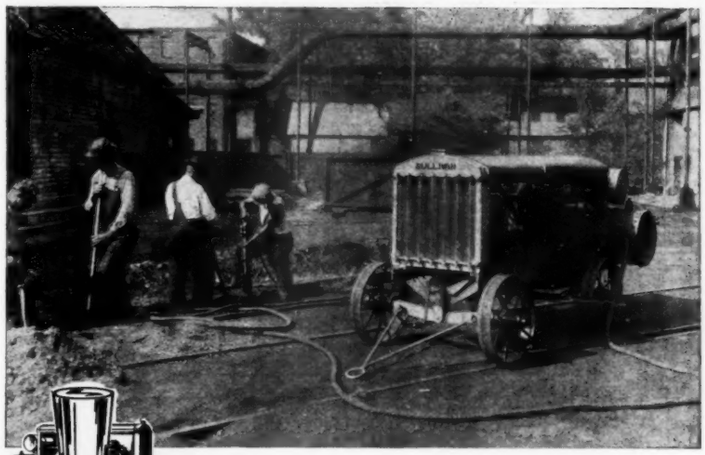
Purgatoire River diverted to north side of its bed.

the company a new 20-year franchise on February 8, 1927, this franchise providing the method by which the change to natural gas could be made and the rates to be charged could be determined. The Denver City Council passed an ordinance on September 5, 1927, giving effect to a contract made between the city and the Public Service Co. which had been negotiated in the meantime. The rates for domestic gas in Denver agreed upon were as follows:

First 400 feet, or less, per month, 90 cents; next 600 feet, 15 cents per 100 feet; next 1,000 feet, 12 cents per 100 feet; next 1,000 feet, 7½ cents per 100 feet; next 7,000 feet, 6 cents per 100 feet; all over 10,000 feet per month, 5 cents per 100 feet. The contract ordinance did not specify the rates to be charged for industrial purposes, but when the original proposal was submitted, it was stated that the industrial rates were to be made by contract, the Public Service Co. to receive 15 per cent of that amount charged, and the joint pipe line interests, 85 per cent and the latter to have the right to approve contracts before they are put into effect.

A similar contract, with granting of a new franchise by a vote of the people, was made with Pueblo by the Pueblo Gas & Fuel Co. on April 6, 1928, the rates provided being the same as in Denver. The Public Service Co. then made a proposal to Colorado Springs, agreeing to take over its municipally-owned plant at a price of $570,000 upon being given a franchise, and to make certain improvements and extensions which were specified. The City Council rejected the proposal and the company then decided to apply direct to the people for a franchise, agreeing to raise its price for the existing distributing system and plant to $600,000. This franchise will come before the electorate at a special election in June. Rates proposed are the same as for Denver and Pueblo.

Negotiations for the delivery of natural gas to other communities, and to industrial concerns, especially cement manufacturing plants at Portland and Concrete, Colo., either are under way or will be taken up as soon as the main line is completed. The contracts with the Colo-



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the Vibrationless
COMPRESSOR

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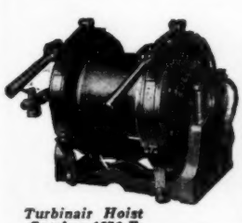

Turbinair Hoist
Catalog 1576-F

but
The Gas Co. laid the pipe

A big factory wanted gas. The local Gas Company wanted to deliver it—but they were stumped.

For all the roads about the place had been dressed down with machine shop turnings and cast iron chips. Old trenching methods couldn't make a dent.

Then some one thought of Sullivan Compressors and Air Tools. A "Vibrationless" Portable Compressor, and a Buster and Spader were brought to the job. The tools went quickly down through the seven inches of iron chips and shavings. And the pipe was laid.

An unusual case—to be sure. But a Sullivan Compressor and Sullivan Tools will also cut rock and hard clay—at twice the speed of hand labor, or faster.

And where pipe laying forms so big a percentage of your product's cost, you will want to make this saving of ½ the pipe-trenching labor.

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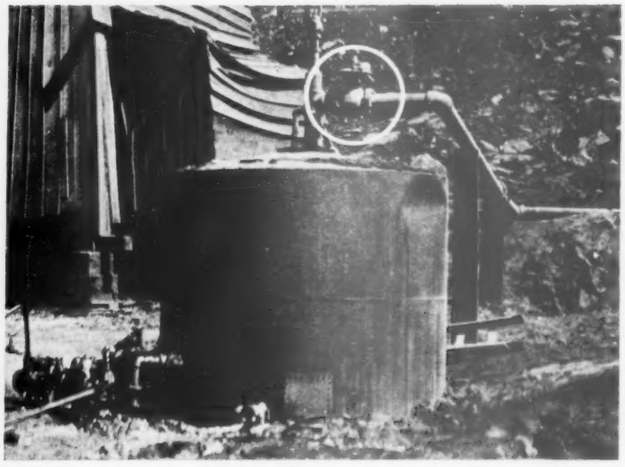

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Accurate well vacuum regulation

UNDER all service conditions, in the most exposed locations, Davis Casinghead Gas Regulators give accurate and efficient control of well vacuum permitting the exact regulation of individual wells independent of the main line vacuum. An equalized control vacuum taken from the line a short distance from the valve insures unusual accuracy. Weather does not affect the action; rain caps thoroughly protect both diaphragm and dash pot.

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DAVIS VALVE SPECIALTIES

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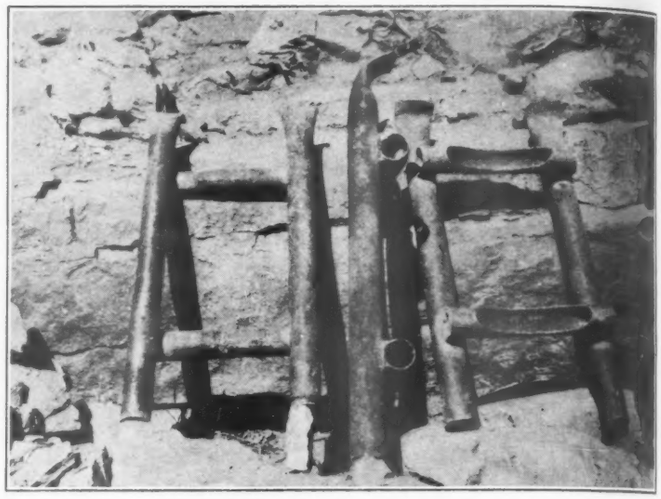
rado Fuel & Iron Co. and the City of Denver, however, were accepted as making the project feasible and plans were then put into operation for the beginning of construction work.

Pipe Line Construction

The producing properties in the Amarillo Field were centered in the Canadian River Gas Co., owned and operated by the Southwestern Development Co., one of the interests participating in the joint program. This company is constructing the field system and the main line from the field to Clayton, New Mexico. The Colorado Interstate Gas Co., jointly owned by the Standard Oil Co. of New Jersey, Cities Service Co. and the Southwestern Development Co., is building the line from Clayton, N. Mex., to Denver, Colo. The Colorado Interstate Gas Co. filed its charter with the State Department of Delaware with an authorized capital of 1,250,000 of shares of no par value. This company subsequently completed its organization with the election of the following officers: W. S. Fitzpatrick, chairman of the board of the Prairie Oil & Gas Co., chairman; Christy Payne, head of the natural gas interests of the Standard Oil Co. of New Jersey, president; A. R. Jones, chairman of the board of the Mission Oil Co., vice president, and J. B. Luse and E. E. DuVall, connected with Mr. Payne in New York, treasurer and secretary, respectively.

Ford, Bacon & Davis, Inc., engineers, were given the contract for the engineering and construction, and offices were opened in Colorado Springs and at Amarillo with E. G. Hill, vice president, in charge. Engineering crews were placed in the field early last spring to find the easiest and shortest route, and this was followed by the final surveys, acquiring of rights of way and other work preliminary to the beginning of actual construction. Early in November, 1927, the contracts were awarded to the Oklahoma Contracting Co. of Dallas, Tex., for the excavation, painting and laying of the pipe and back filling on the line to be operated by the Canadian Gas Co. from Amarillo to Clayton, N. Mex., and to Williams Brothers, Inc., of Tulsa, for the line from Clayton to Denver. On December 10, 1927, O. F. Fath, president of the Pueblo Commerce Club, took the operator's seat on an excavator, pulled a lever and put in motion the construction of the new line. The ceremonies took place south of the Arkansas River in Colorado, at Devine, 9 miles to the east of Pueblo. Actual construction began December 13, 1927.

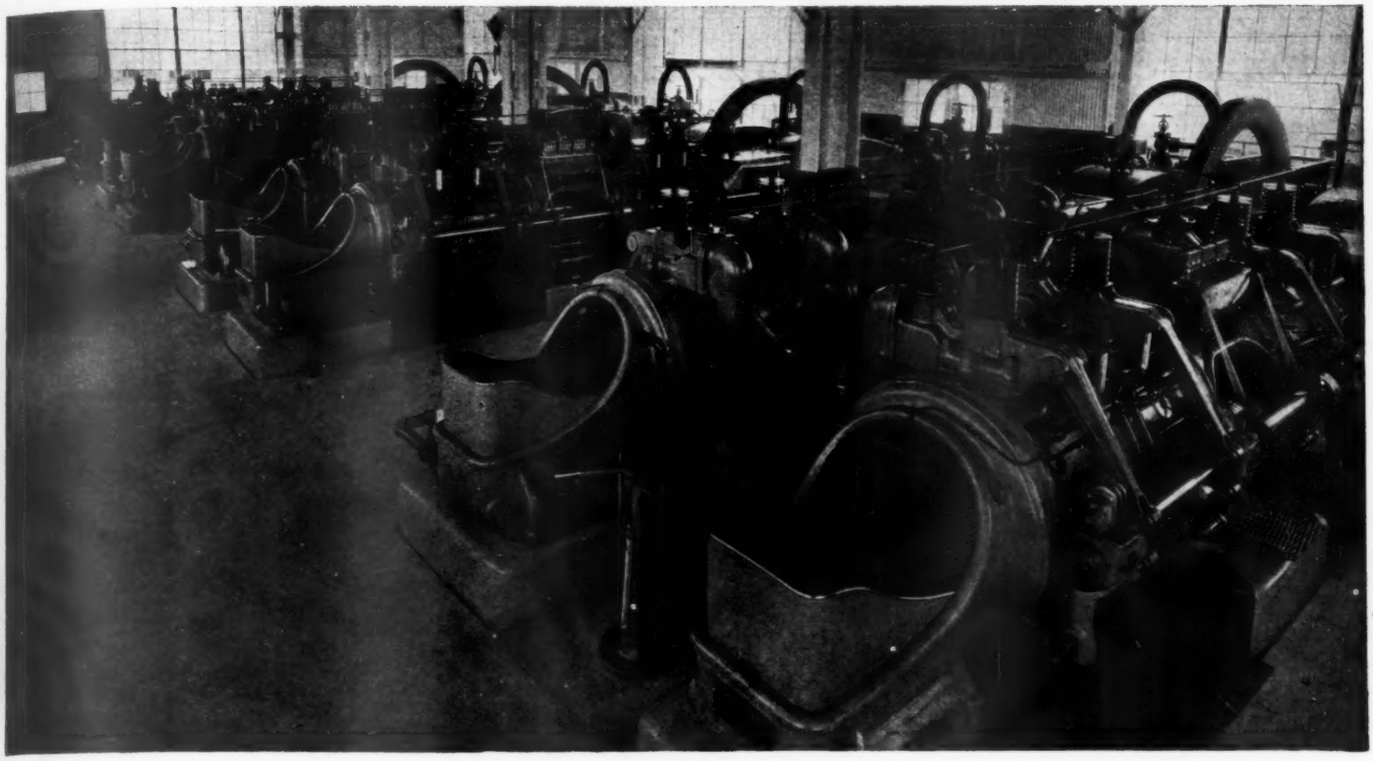


Bottom, side and top views of sleds used to support coupled pipe for movement down hill.

Main Line and Branches

The main line when completed will be 340.7 miles long, exclusive of the field system. The Canadian River Gas Co.'s line from the field to Clayton, N. Mex., will be 86.3 miles long and will be constructed entirely of 22-inch plain-end pipe. The Colorado Interstate Gas Co.'s line from Clayton to Denver will be 254 miles long, of which 149 miles is 22-inch pipe and 105 miles is 20-inch pipe. The branch from the main line to Pueblo will be 11.5 miles long and consists of 16-inch pipe. Details on projected lines from the main line to Colorado Springs, and from Pueblo to Concrete and Portland have not yet been determined finally, but these

Laying 2 miles south of Denver.



Four Worthington-Snow type 18½-in. x 20-in. Horizontal Double-acting Twin Tandem Gas Engines rated at 700 hp. at 200 r. p. m. in the Magnolia Gas Company plant, Waskom, Texas. These engines drive 16-in. x 20-in. Worthington-Snow type Compressors of the removable liner type. 20-in. stroke engines by their use reduce the total cost of the plant including foundations and buildings because of the higher speed and therefore lighter weight of the engine.

Gas Engine Compressor Equipment Standardized

(From the smallest unit to the largest unit for main-line stations)

THE gas station of the Magnolia Gas Company at Waskom, Texas, is a remarkably fine example of the latest design. Ground for this plant was broken on August 10th and the machinery was ready for operation approximately three weeks after its arrival at the plant site. Since going into service, the engines have demonstrated to the entire satisfaction of the user their ability to handle capacities above their ratings.

Even the largest gas company can now standardize upon its compressor equipment from its smallest unit up to the units for its main-line stations. Worthington can furnish units from 170-hp. single-cylinder to 700-hp. twin-tandem units with engines using exactly the same power cylinders, frames and shafts, all parts being interchangeable on the 170 hp., the 700 hp. and the intermediate sizes of 350-hp. twin, and 350-hp. single-tandem units. In other words, a large gas company which has standardized on this machinery can have small engines in its field stations and large engines in its main-line stations with all parts completely interchangeable. It is also possible to add power cylinders to the single units so as to increase the capacity as the requirement for increase arises at comparatively nominal cost.

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OIL *and* GAS ENGINES

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6741-27

Is Pop's refinery well organized?

"Here, Lad—

I'm getting along in years and have my refinery so well organized and my ideals on good practice so firmly set, that for me to change my tactics in equipping the new plant by using arc-welded construction in place of castings and riveting—well, I'm just too old to learn."

"No, Pop—

age is not a time of life—it's a state of mind and that can be changed without changing your ideals.

Your ideal is equipment that doesn't spring leaks. Your riveted jobs do spring leaks and you call in a welder to patch them up.

Let's put in 'Stable-Arc' welded joints in the first place to *prevent* leaks.

That doesn't desert your ideal—it betters it. Your other ideal is to keep down production cost.

They're using the 'Stable-Arc' welder on new pipe lines, saving money on joints. They're using it on heavy valves, saving weight and money,—just as modern power plants are put up with 'Stable-Arc' welded ducts, piping, frame work, breeching, etc.

All for the sake of economy and for continuity of operation.

A man is never too old to learn, young Pop, but he's usually too young to realize it."

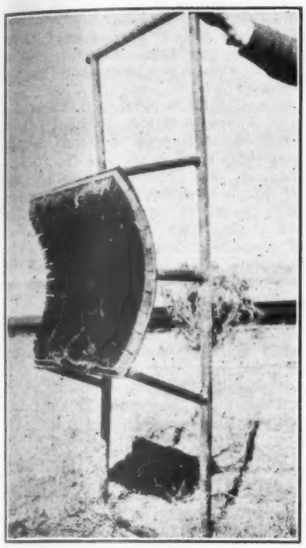
The Lincoln Electric Co., Dept. 26-5, Cleveland, Ohio

"Stable-Arc" LINCOLN WELDER

W-47

will be approximately 6 and 29 miles long.

Approximately 50 miles of gathering system consisting of pipe varying in sizes from 4 inches up to 22 inches is being constructed in the field by the Canadian River Gas Co. The highest elevation reached by the main line is 7,000 feet, at Palmer Lake, between Denver and Colorado Springs. The lowest point is 3,800 feet above sea level, at Amarillo. One booster station is being constructed at a point 33 miles north of Amarillo to take the gas from the wells and deliver it to the main line. This station will be equipped with three 1,000 horsepower units consisting of Snow compressors manufactured by the Worthington Pump & Machinery Corp. The program calls for 4 booster stations, but the one north of Amarillo at Biven will be the only one constructed this year. One of the others will be built at Clayton, N. Mex., another at a point east of Trinidad, Colo., and the other at Devine, 9 miles east of Pueblo. The capacity of the line will be approximately 100,000,000 feet of gas per



Saddle brush for cleaning pipe.

day, but it is not expected that the consumption requirements at first will equal that quantity.

Absorption Plant

The Canadian River Gas Co., which is building the booster station, also will have a gasoline absorption plant at the same point to receive the discharge of the compressor station. This plant is being furnished by the Jackson Engineering & Equipment Co. of Los Angeles. Its initial capacity will be approximately 18,000 gallons of gasoline per day, but this will be built up to a capacity of 30,000 gallons.

The schedule originally provided for the completion of the line by September 1, 1928, but favorable weather, the employment of experienced contractors and the use of improved construction methods have advanced this date considerably. The work is approximately 90 per cent completed at this time and the joint interests expect to be giving service to Pueblo by June 1, and to Denver by July 1. At this time 320 miles of pipe have been laid and back-filled. The line between Amarillo and Dalhart is now being tested and the testing of the remainder of the line will proceed progressively as the work is completed.

The pipe used in constructing the line was rolled by the National Tube Co., a subsidiary of the United States Steel Corp., and Spang, Chalfant & Co. These two companies are said to be the only concerns in the country which could make pipe of the size and quantity required. Delivery of pipe commenced early in November and on the northern end reached as high as 15 cars per day. The pipe order aggregated approximately 81,000 tons in weight. The largest number of men employed on the northern end at one time was 1,500.

The proposal to bring natural gas from Texas into Colorado aroused wide discussion at the time it began to take definite shape and there was strong opposition to the project from the coal operators and less pronounced opposition from some of the railroads that have a large tonnage of coal. However, just at the crucial moment a strike took place in the coal fields and the opposition disappeared. Those who have made a study of the situation point out that while the introduction of natural gas may work some injury to the business of retail coal dealers, that the producers, as a rule, find new markets to offset the losses. An illustration of this was the results at Edmonton, Alberta, in 1923, when natural gas was introduced. The town lies immediately over a lignite coal field, but now gas is used almost exclusively for domestic fuel and the coal operators have found other markets for their output.

The rapid progress with which the line has been constructed, the methods employed, the extensive sampling of soil, the physical difficulties encountered, and other details of the actual construction are considered in another article.

OH, WELL; SOUNDS ALL RIGHT ANYWAY

Whether the men laying the Amarillo-Denver pipe line had faith to remove mountains or not, they had what served the purpose, skill and blasting powder. But faith, skill and high explosives weren't worth three whoops in a rain barrel in dealing with a thing they encountered in Las Animas County, Colorado. That was Purgatoire River—not the pipe-laying job, you understand, but the pronunciation. For, would you believe it, every mother's son of them had left his French dictionary at home.

Was there a man dismayed. Not that you could notice.

Folk in that region called the river something that sounded to untrained ears like "Picket-wire." So "Picket-wire" it was pronounced and written.

Not so bad either, for consultation later with the dictionary revealed this: "Purgatoire, pur-ghah-twar, purgatory, limbo."

Now say that "pur-ghah-twar" father fast. Get it?

GAS MEASUREMENTS WITH ORIFICE METERS

(Continued from Page 114)

be of the same size, but the arrangement should be symmetrical and approximately uniform, so that, for example, not all large tubes would be on one side and small ones on another, or a large tube in the center with much smaller ones around the outside.

Warning on Construction

Experience in the experimental work makes it advisable for the committee to warn against too flimsy construction of the vanes. The vane tubes should be firmly welded or otherwise strongly attached to one another to prevent their being broken up and lost in the line.

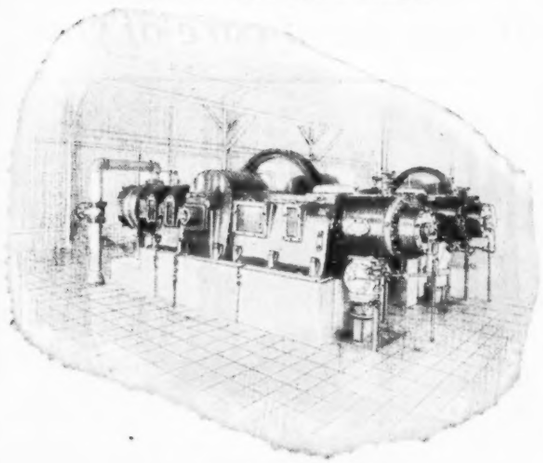
The following additional suggestions were not included in the report: The width of the cylindrical portion of the orifice should not be greater than 10 per cent of the diameter of the orifice, and if the plate is thicker than this amount, the downstream orifice should be bevelled off at 45 degrees so as to fulfill the preceding recommendations.

The tap connections at the main line should be examined to see that the nipples and gaugeline connections do not project into the line.

The distance from the orifice to the centers of the taps should be noted. A small variation in these distances will not produce any error when using small

GARLOCK

Gas Compressor Metal Packing That Does Not Leak



GARLOCK-875

For Piston Rods in Good Condition

High Pressure Service

Garlock-875 is an improved design Gas Compressor Metal Packing which, after severe service tests, has established itself as the ultimate packing for this purpose.

It reduces operating cost as it will not score or wear the rod out of round. The combination breaker-scraper rings remove the sand and grit, an abrasive element, from the piston rod and the method of lubricating allows the rod and rings to work in an oil bath.

The High Pressure Packing is an assembly of eight sections of rings, two pressure-scraper rings and six double packing rings, enclosed in a sectional cup case as illustrated, or a split case if required. All parts of the packing are accurately machined and ground. The rings are manufactured from high carbon content interstitial cast iron and so designed that incorrect application is impossible.

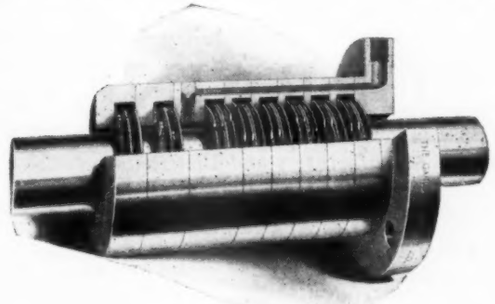
The High Pressure Packing is recommended for Gas Compressor Service handling all medium and high pressures.

Low Pressure Service

Garlock-875 is also supplied to work against low pressures. It is made of the same material as the High Pressure Packing with a slight change in design. Five sections of double packing rings are enclosed in a sectional cup case, or a split case as may be specified. Where gas containing grit is encountered one of the double packing rings is eliminated and one or two breaker-scraper rings substituted.

Blue Prints and Specifications

Complete specifications and blue prints will be supplied upon application. We suggest that you write our nearest Oil Field Sales Office.



Garlock-875 for High Pressure Service

The Garlock Packing Company
Palmyra, New York

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The Standard Packing of the World

Take good care of your sucker rods and they will take good care of you

It doesn't take much to damage sucker rods beyond repair; even slight bending strains may weaken a rod to a point that endangers the entire string. Keep your rods in the Lorraine Sucker Rod Rack—well out of harm's way and out of the way of workmen on the derrick floor.

And you'll save time, too, in pulling a string with the Lorraine Rod Rack. The derrickman can place a stand in the rack perfectly and quickly while the elevator is on the way down for another.

Take good care of your sucker rods and they will take good care of you. A special folder describes the Lorraine Rod Rack in detail. Want it?

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orifices, but when large orifices are used, quite a difference may occur.

One way to test an installation to see that the flow of gas through the line is central with the pipe and the orifice, is to install pressure taps in the line or in the flanges opposite the taps which are used with the meter, and connect a draft gauge or a U gauge across the pipe to the opposite taps. If a differential is produced, it indicates that the pressure at the two taps is not the same, and therefore either the flow through the pipe is not central or there is some obstruction creating the difference. The test is simple and will determine whether the measurement is affected by bends or regulators close to the orifice meter setting.

Explained in Detail.

The following paragraphs explain in detail additional items which should be considered in a complete check of an orifice meter installation or installations where differences in measurement have occured.

The meter should be examined to see that the pressure range of the spring used in the meter is the same as the pressure range indicated on the chart. The spring should be checked throughout its pressure range, especially at the range at which it is generally used. When testing pressure springs it is recommended that these springs be tested with an inspector's test gauge, the inspector's test gauge, thus having previously been calibrated against a dead weight tester or, if of low range, preferably against a mercury column.

Meters should be checked for differential range throughout the limits, especially at zero under working-pressure conditions.

The coefficients apply for orifices of certain diameters for gas of a certain specific gravity and temperature. They must be revised to apply to actual conditions.

The diameter of the disc should be checked with a good micrometer. In some cases the diameter of the pipe should be measured. Quite frequently heavy pipe or casing is used and the coefficient of the orifice is based on pipe of standard diameter. A difference in the diameter of the pipes produces only a small difference in the coefficient when the orifice is small, but for the larger sizes of orifices, larger differences occur.

In some instances, the difference in results between meters apparently measuring the same gas may be due to water contained in the gas in the form of moisture. The orifice meter weighs all of the water as well as all of the gas which passes through, but it does not indicate how much water.

Effect of Pulsation

Another item which has been the subject of considerable controversy is the effect of pulsation on orifice-meter measurement. It is undoubtedly quite possible to eliminate the effect of pulsation, but apparently no set method of eliminating or determining the effect of pulsation has been put into commercial practice at this time. Quite frequently the differences or discrepancies between meters have been blamed on pulsation, although the effect of pulsation has been negligent. In other words, pulsation has been blamed for a lot of differences which are not due to pulsation at all, one of the most frequent being the case of meters at the inlet and outlet of absorption plants.

It has been thought that the effects of pulsation might be considerably lessened, if not completely eliminated, by the use of discs in the line on the downstream side of the meter installation, the size of the discs being such that they will produce a differential of approximately 100 inches of water.

There is another problem which occurs in the calculations of charts from flowing wells. The use of vibration bushings in the meter or the contraction of the passage between the high and low chambers of the meter, frequently reduces the range of vibration of the differential pen arm. The reading produced on the chart will be an average reading, rather than maximum and minimum readings. The most accurate method of calculating these charts is to obtain the quantities represented by the high and low readings. The best value is the average of these results.

A problem of high pressure measurement which has apparently caused some uneasiness is deviation from Boyle's law. It is quite possible to make a very good determination of this deviation by simple calculation when the constituents of the gas are known.

In all of the calculations relating to flow of fluids through orifices, the usual formula and expression of flow is based on the assumption that the difference between the upstream pressure and the downstream pressure is small when compared with either the upstream or the downstream pressure, or that the differential is small when compared to the pressure.

All of the published coefficients were based upon experimental data obtained by using orifices in which the ratio of differential to pressure was law. These coefficients should be used in a similar manner in actual measurement. The differential reading in inches of water should not exceed the value of the static pressure in pounds per square inch absolute for any type of connections in order to obtain results without the use of multipliers.

Although the Natural Gas Department of the American Gas Association and the United States Bureau of Standards have conducted a great number of experiments, sufficient data has not been obtained and corroborated by the various authorities to warrant publication of definite data at this time in regard to the best values of coefficients for widely varying conditions of the ratio of differential pressure to line pressure, viscosity and constituents of the gases.

The orifice meter is an accurate instrument for the measurement of gas, and is as accurate as any other method for measurement of large volumes under high pressure when used under proper conditions and where the factors which are known today are applied.

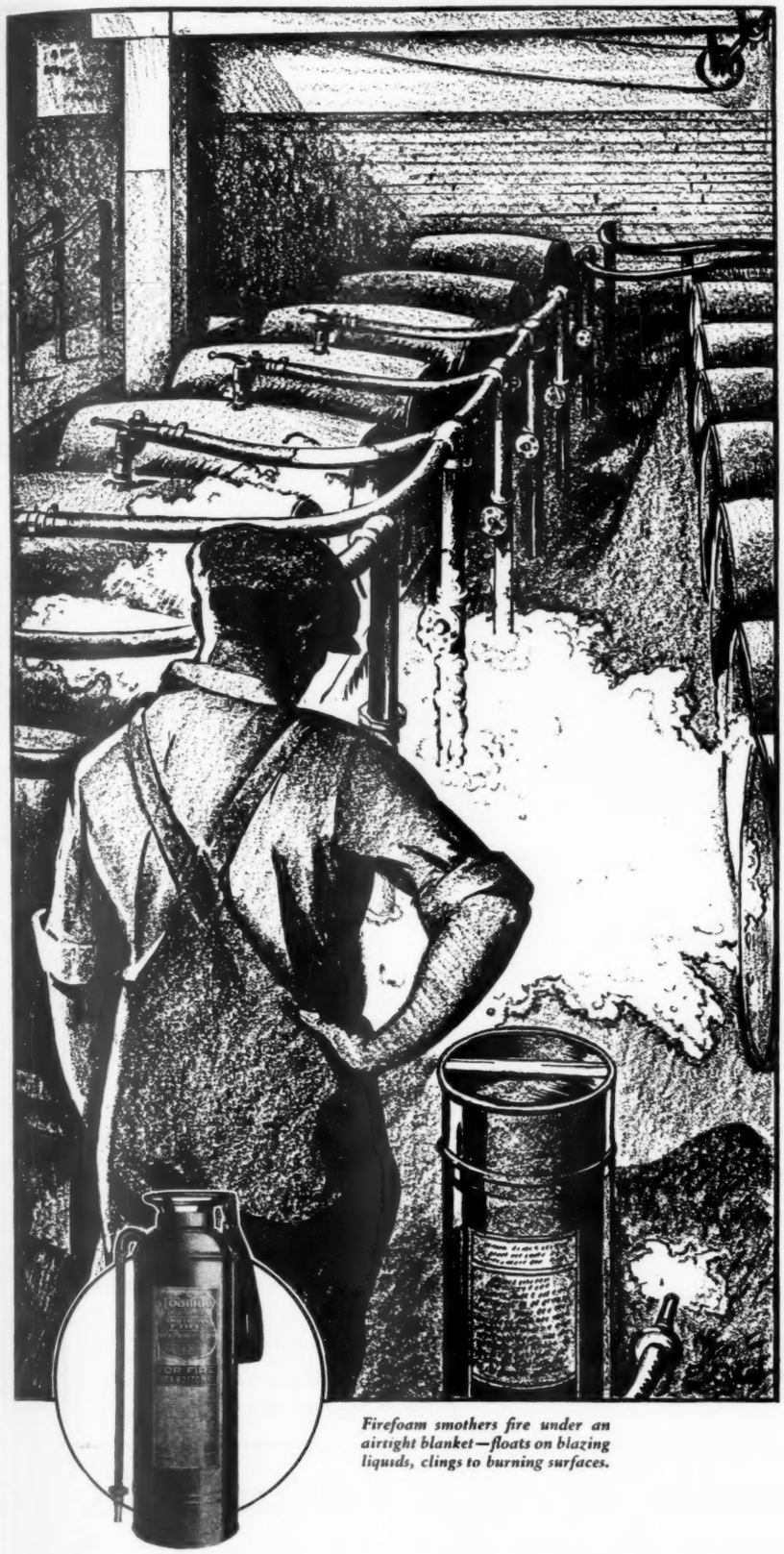
PIPE LINE CORROSION AND PROPER PROTECTION

(Continued from Page 114)

od does not offer protection where corrosive ground water is present in quantity. When lime is used alone or sand mixed with lime, Side boards are generally used to form the material around the pipe. This method of protecting the pipe has been used with some success in protecting lines which have been laid in the ground for some time and which cannot be taken out of service for treatment. When lime is used it is necessary to clean the pipe for inspection only, which is a comparatively simple task to the one of cleaning the line for a bituminous coating. The cost of protecting pipe in this manner, of course, depends entirely on ability to dispose of excavated materials and to obtain non-corrosive material for back-filling. It has been chiefly used to protect eighteen and twenty inch lines which could not be removed from the ditch for treatment.

In a few parts of the country where the life of unprotected steel pipe is reported to be less than three years, a waterproof cement grout made of one part of Portland cement to two parts of suitable sand has been used with good results. Several companies have reported that this is the preferred method of protecting pipe lines through marshy country containing highly corrosive ground water. The pipe is usually given a bituminous dip coat before enclosing it in the cement casing which is usually about two inches thick. Steel forms are generally used to mold the cement around the pipe. This coating is a very expensive one to apply and is used only in very special cases. To be effective, this cement casing must be absolutely waterproof.

In a similar manner, asphalt having a melting point of about one hundred and fifty degrees Fahrenheit has been molded around pipe where the soil conditions have been such as to warrant special treatment. Wooden forms are com-



Firefoam smothers fire under an airtight blanket—floats on blazing liquids, clings to burning surfaces.

The fire that died young

It gave promise of being a strong, healthy member of the Fire Family in an amazingly short time—promise of doing as much damage as many another fire had done.

But it died young. A FOAMITE Extinguisher smothered it under a blanket of *Firefoam.*

It died as you want all your fires to die—and as they can, if you are adequately protected with FOAMITE Extinguishers. Study your plant today. Locate all the places where fire might break out—and see that they are protected.

The 5 Gallon FOAMITE Extinguisher generates over forty gallons of *Firefoam,* and throws a stream about thirty feet. On the small fire it is just as effective as your FOAMITE System is on the larger fire.

Ask for a demonstration of this 5 Gallon FOAMITE Extinguisher. There are representatives at points convenient to all principal oil producing and refining centers. American-LaFrance and Foamite Corporation, Engineers and Manufacturers, Dept. F-6, Elmira, N. Y.

AMERICAN-LA FRANCE & FOAMITE PROTECTION

A Complete Engineering Service for Extinguishing Fires

Reid
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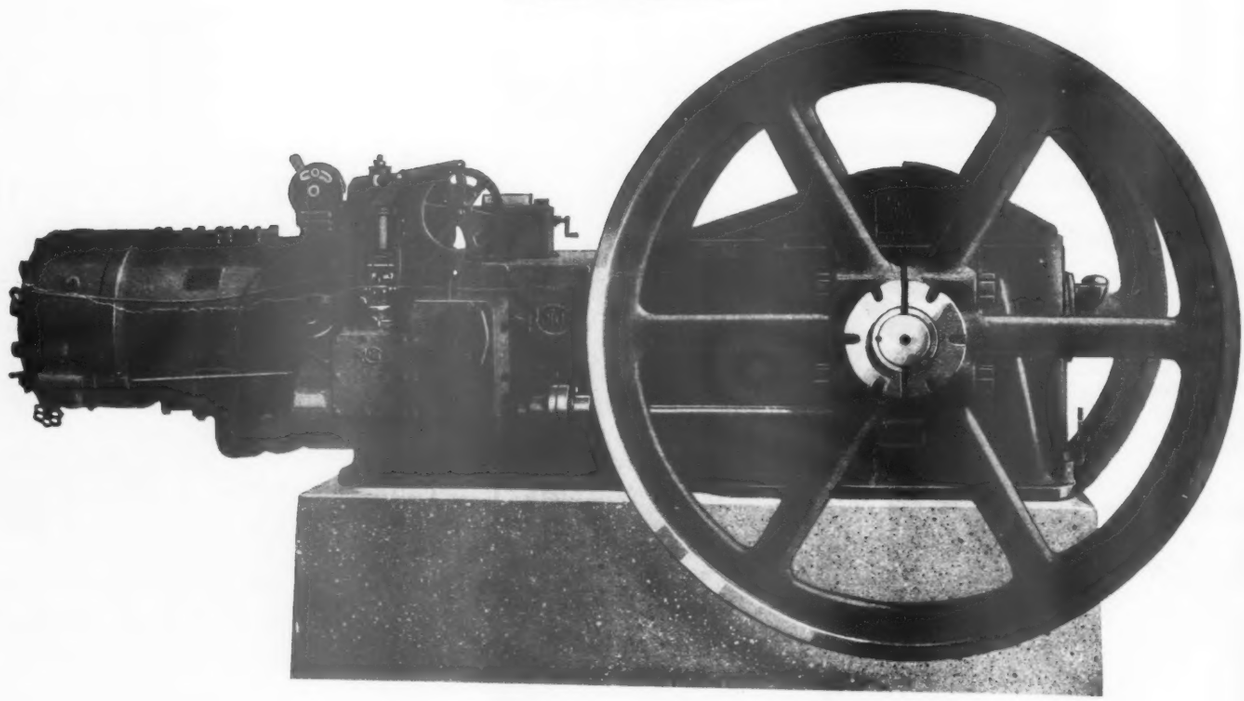

Governor Side—Reid Type C Gas Engine

SPEED with POWER

In doing heavy reverse work, an engine must be fast, and must hold its power at high speed. The power curve of the Reid Type C Enclosed Gas Engine is excellent, and does not drop suddenly when the peak is reached.

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Features

- Entirely enclosed bed plate.
- Splash oiling system.
- Replaceable main bearings.
- Bored cross-head guide.
- New Reid governor, enclosed and running in oil bath.
- New intake valve on top of cylinder.
- Improved speed wheel arrangement.
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GAS ENGINES—OIL ENGINES—PUMPING POWERS
LOOK BOXES—MANIFOLDS

monly used for this purpose and the pipe line supported on glass blocks so that the asphalt flows completly around the pipe. Before applying this coating the pipe must be thoroughly cleaned and entirely free from mill scale, grease, and moisture.

Electrolysis

How much protection against electrolysis is obtained by the use of any practical method of treating pipe now in general use is an open question. Under some conditions, certain coatings seem to protect the pipe in a measure, but under other conditions the same coating seems to do little or no good. Insulating couplings, properly applied, have been used with more or less success in protecting the pipe from electrolysis. The best method of preventing corrosion, due to electrolysis, is to keep the current off the pipe in so far as possible. This is not an easy thing to do and requires the services of men familiar with the problem. The co-operation of the companies operating the electric railway and light systems is absolutely essential in this work. Far-reaching results, however, are often obtained by an intelligent survey of the situation in conjunction with engineers representing the electric companies. These surveys often uncover the real cause of the trouble and indicate to both the gas company and the electric company what changes must be made by each of them to remedy the situation.

Problems which cannot be solved quickly and decisively are apt to become uninteresting to the men upon whom rests the burden of supplying the correct answer. Pipe corrosion and protection falls under this heading. For many years, almost since the introduction of wrought iron and steel pipe, gas company engineers have discussed the relative merits of coated or treated pipe as compared with uncoated pipe, and the relative merits of one method of protecting the pipe against soil corrosion as compared with other methods. Some companies have made considerable progress in solving the problem, at least in so far as their particular soil conditions are concerned; other companies have given up, for various reasons, after expending more or less money on the proposition, and still other companies have stood by, contending that a satisfactory method of doing the work has not been developed for their particular conditions and that they would not be interested until such time as definite results could be assured which would warrant the cost of the protection. All companies, however, recognize the advisability of using some method of protecting their investments, and indications point to a more intensive study and at least a partial solution of this problem in the near future.

REGULATION OF GAS PRESSURE IN LINES

(Continued from Page 119)

a movement in the valves of the regulator. On a 20-inch diaphragm which is usually used on the 4-inch regulators for standard low pressure service, a change in pressure of this amount produces an unbalanced effect on the diaphragm of approximately 5 pounds. It is apparent that it would take no excessive amount of dirt, or binding of parts to prevent this small amount of power from operating the valve. While this differential in balance will readily operate the proper design of regulator in good mechanical condition at low pressures, it would be unreasonable to suppose that it would operate the same regulator at considerably higher pressure.

Keeping in mind the scales, we might make this comparison: A balance delicate enough to accurately measure a fraction of an ounce would not necessarily be affected by the addition of that same fraction if both sides were loaded with 20 pounds. Therefore, the diaphragm, the construction of the diaphragm chamber and supports and the amount of slack left in the diaphragm are of great importance but, in themselves, they cannot control the action of the regulator, unless the valve body and the valve design is considered with them.

It is important that the valve ports have sufficient area to cause the valve to make a minimum amount of lift to deliver the maximum capacity obtainable through the ports at various pressure drops across them.

A regulator has no capacity, except when its valves are wide open. The volume which will pass varies as the square root of the differential drop in pressure across the ports. For all other positions of the valves, the quantity passed is roughly proportional to the lift of the valve. That is, if the valves are half-open, it would pass approximately one half of its maximum capacity. If a valve has to make too great a rise to deliver its full volume it will cause an actual change in the effective area of the diaphragm upon which the pressure before the valve would move. The case in mind was the conversion of a high pressure regulator by changing the head so as to deliver intermediate pressures, where the difference in inlet and outlet pressure was less than 10 pounds.

A manufacturer frequently installs in high pressure regulators, long stroke valves having v-shaped port openings or an extra lip under the top valve, to prevent wire drawing. The reason for this is that so many regulators are installed of the same size as the line in which they are set. It results in two things which are not necessarily advantageous to perfect regulation because of the fact that the stroke or the lift of the valve is increased and the valve unbalanced. In the case of the first method it also follows that the capacity is cut down. If balanced valves were installed on these regulators the resulting short lift at periods of low demand would produce wire drawing, ruining the seats and valves in a very short time.

Proper Size of Regulator

The fact that it may be necessary to lay a 6-inch line to carry sufficient gas for the ultimate demand, or to overcome the friction loss due to the length of the line, does not necessarily mean that a 6-inch regulator should be placed in this pipe. With a materially higher inlet pressure, a 3-inch or 4 inch valve would pass as much or more gas than the 6-inch line on the outlet could handle on account of the reduction in pressure. Therefore, when regulators are installed on their capacity there is a great saving, not only in the initial investment but also in the benefit gained by greatly improved control of pressure. With the proper size of regulator for the load balanced valves can be used for they are not in danger of being damaged.

The use of pilot valve or auxiliary operated regulators has become quite general for the reason that they permit the use of greater pressure on the diaphragm controlling the valves than the outlet pressure which is to be carried. This results in improved regulation because the power is there to overcome any of the conditions referred to above.

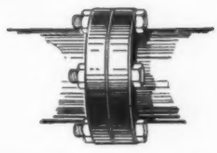
There is a well-known low pressure regulator with perfectly balanced valves which makes use of two diaphragms and a multiplication of the power from these diaphragms, by a system of linkage to the lower arm.

It can readily be seen that the accumulation of deposits upon the valves and valve seats can unbalance a perfectly balanced valve. An increase in power is necessary to operate the regulator when it occurs. This power can come from only one source, when the usual single diaphragm regulator is used, and that is by the increased changes in the outlet pressure.

Usually in the pressure piping to the diaphragm case there is placed a stricture. If this small opening becomes clogged with dirt the regulator is practically inoperative. It frequently happens during periods of maximum demand that the flow across the opening of the diaphragm pressure piping causes a false pressure on the diaphragm. The control of the pressure then becomes erratic. In this case, the diaphragm piping should be taken from the main lines and connected to the end of the by-pass on the outlet side, or else extended the center of the pipe and the opening turned downstream.

Most of the manufacturers of regu-

THE JOB OF A JOINT



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THE WALLS of the Cross cracking furnace shown under construction above in an English refinery are insulated with a course of Sil-O-Cel C-22 brick between two courses of fire brick and two of common brick.

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lators punch-mark the parts so that in assembling they will maintain the same relation in which the drilling for pins was made. In tearing down a regulator for cleaning and repairing, care should be taken that these markings are still visible, and in case they have been obliterated by wear they should be marked so that in re-assembling they will take the same alignment as they had. This is probably more important in regulators which have been used than it is in their original assembly, because a certain amount of wear has taken place.

Summary

In summary, the following points shoud be kept in mind for improved pressure control:

The openings to the diaphragm cases should be clean and giving true pressures.

In assembling regulators after cleaning and repairing, care should be taken that the parts are put together in the same relation that they originally had.

The regulators should periodically be given a thorough cleaning, and any binds due to the misalignment of parts should be eliminated.

The regulators should be equipped with the proper diameter of diaphragm for the pressure to be carried.

The regulators should be of a design for the work which they will be called upon to accomplish.

And finally, the size of the valves should be determined by the amount of gas which they are to pass for given inlet and outlet pressures.

ACCURATE ESTIMATES OF GAS RESERVES

(Continued from Page 86)

liverable" gas. This is not an attempt to split hairs but under present conditions all recoverable gas is not deliverable, or in other words not available for sale. Gas blown into the air for taking open flow volume readings of gas wells is considerable and was "recoverable" when in the reservoir but is not available for sale at the surface and such gas will not be sold so long as gas well volumes are determined by present open flow methods. Also gas blown into the air during initial cleaning when wells are brought in is recoverable, but not sold; the same with gas used for fuel in drilling operations in gas fields. Gas used for drilling has a value to the gas field operator as a saving of fuel expense but it is not usually a source of income. Possible income or industrial and domestic supply determinations should be based on possible delivery and not on possible recovery. On that basis the term "deliverable gas" is used in this article.

"Rock Pressure" vs. Reservoir Pressure and "Shut-in Pressure": There is no more important factor that needs an attempt at up-to date interpretation than "rock pressure." It is one of the most widely and flexibly used terms in a gas field. In gas carriers', operators', and corporation commission reports and in general discussion the term rock pressure is used to mean the pressure reading taken at the surface connections after the well has been shut in sufficiently long to build up a maximum pressure. Also, in discussion of underground gas reservoirs, the pressure under which the gas is compressed in a reservoir is usually called "rock pressure." In the case of a gas well that has in it a head of salt water, not unusual in a gas field, the actual pressure of the gas in the reservoir is higher than the shut-in pressure reading taken at the surface connections, due to and in proportion to the column of water. In some cases where heavy delivery is taken for several winter months the shut-in pressure readings drop considerably but partially recover after heavy delivery drops. For all practical purposes in field usage the term "rock pressure" is thoroughly understandable in reports and in discussions between gas men but they subconsciously flex the term and apply it to the proper place. When it comes to explanations to others or to finely subdivided technical discussions such as estimated gas reserves the multiple usage of the term "rock pressure" is confusing.

Rock pressure originally was intended to mean the pressure exerted on the top of an underground reservoir or stratum by the overlying strata of "rocks." As a result of removal of coal strata from under Scranton, Pa., there was a consequent subsidence at the surface, a true effect of rock pressure. In an underground gas reservoir the gas is not the stratum on which the rock pressure is exerted but it is compressed in the stratum by pressures other than "rock pressure" in its original meaning. An exception to that would be very rare so the term "rock pressure" as originally intended, besides having present multiple usage, really has little or no relation to the actual pressures influencing gas in a gas field. If there are any cases of surface subsidence over a natural gas reservoir they were more than likely not directly due to the withdrawal of gas.

For the purpose of clarity the multiple term "rock pressure" is dropped in this article and "reservoir pressure" is used to mean the pressure of the gas in the reservoir and "shut-in pressure" is used to mean the pressure reading taken at the surface connections when the well has been shut in long enough for a maximum pressure build up.

Unseen Factors of Importance

Reservoir Pressure—Its Cause: It is determined by taking the average shut-in pressure reading of gas wells that are not "wet" and adding the head pressure of the weight of the compressed column of gas from surface to reservoir level. It is then converted to absolute pressure, if needed. In the wet wells head pressure of the fluid must be considered.

The pressure that compresses natural gas in the reservoir is in reality exerted either by level-seeking of water that is present and was associated at time of deposition with the organic matter that later decomposed into natural gas and residue, or, where the water pressure is decidedly low or absent, exerted by the natural expansion of gas during organic decomposition, the gas gradually filling the reservoir until it finds travel restricted and then starts packing until decomposition is completed.

That is an attempt to explain the cause of reservoir pressure, one of the most important factors in making reserve estimates.

Process of Accumulation of Dry Natural Gas; Relation to Reservoir Pressure: There is abundant evidence that the kind and nature of the original organic matter, manner of deposition and subsequent decomposition are prime factors in the process of generation, accumulation and of quality of natural gas; and that those factors have a relation to reservoir pressure conditions. An understanding of the relationships of reservoir pressure makes the going easier in making accurate reserve estimates.

An interesting and most recent observation of evidence of those factors is reported from France: "Subterranean gases released by workmen digging a well near Corenc have led to the discovery of the remains of a once well-known forest which was destroyed by a gigantic landslide on Mount Saint Eynard in the year 1278. The workmen noticed the gases bubbling up through the water. When they dug further to learn the source of the gas they came on massive tree trunks, roots and branches of enormous oak, the fiber of which was decomposing and creating the gas. Scientists in checking up the discovery have found records telling of the occasion when forest lands at the spot were completely covered by an avalanche."

There is a whole mass of older evidence backing that process of accumulation, including cores, taken during rotary drilling that show the existence of decomposed fibrous and wood-like organic matter in a certain deep gas sand that is a very prolific producer.

Edge Water Conditions

Edge water, usually salty, when found in a natural gas field is in the same porous stratum as the gas but down on the flank of the structure and, as its

Simplicity of Construction

White Star Gate Valves

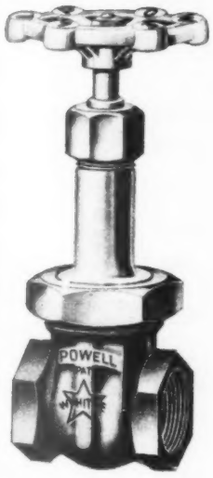


Fig. 375
Bronze White Star Gate Valve Exterior

Powell White Star Gate Valves are ruggedly constructed of few simple parts. All parts are accurately machined and are interchangeable. Body and bonnet are joined by means of a heavy union nut. Lugs cast on sides of discs engage in grooves cast in body, and accurately guide disc without undue friction on seat faces.

Simplicity of construction warrants elimination of needless parts.

Powell Valves are particularly adapted for handling oil, gasoline and other volatile and hazardous liquids and gases.

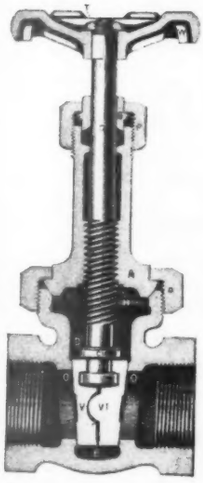
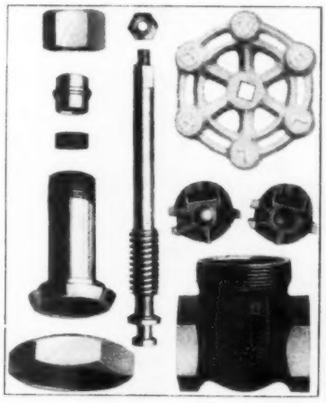


Fig. 375
Bronze White Star Gate Valve Sectional

Reinforcing ribs cast in the body shell and additional thickness in the hexagon ends assure strength and safety, and relief from undue strains created through expansion or contraction, and weight of piping. They can be repacked under pressure when the valve is wide open. Sizes ¼ to 3 inches.

Double disc with ball and socket back are so designed to compensate for seat angle insuring a tight valve at either port.



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name implies marks the edge of the gas reservoir part of the porous stratum.

Edge water influences shut-in pressures in two ways: One of them directly affecting some individual gas well shut-in pressure readings and the other an indirect influence on all shut-in pressure readings of gas wells producing from the same reservoir.

The former or direct influence on individual well shut-in pressure is effected on gas wells that have penetrated edge water or in which edge water has encroached. Any amount of that water finding its way into a gas well lessens the shut-in pressure of the well. As the water column builds up in height the shut-in pressure drops proportionately yet the pressure of the gas in the reservoir remains the same. Consideration of this is important to the estimate maker since shut-in pressure readings are vital. In determining the shut-in pressure of the field, for estimating, by averaging individual well readings the wet wells should either not be included or corrected to true shut-in pressure by including the water head.

The indirect influence of edge water on all shut-in pressure readings of wells producing from the same reservoir is caused by the encroachment of such water following withdrawal of gas. That encroachment, or gradual climb, up the flank of structure actually decreases the size of the gas reservoir. A decreasing size of reservoir is equivalent to increasing pressure of gas in the reservoir. That influence on reservoir pressure is in turn transmitted to shut-in pressure readings and must be understood and allowed for in making estimates. If the changing size of reservoir is not considered then all shut-in pressure readings actually will be too high and consequently throw the reserve estimate high.

Sometimes a low gravity residue oil is found on the edge of natural gas fields instead of edge water and its effect on gas is very similar to edge water. For clearness in limited space this article is confined primarily to consideration of dry natural gas and edge water.

There are other unseen factors in gas fields but they are less important. However, there should be an understanding of gas measuring methods. There is plenty of published authoritative data on gas measurement.

Relation of Subsurface Geology

Subsurface Structure Contour Map: Such maps are vital to making reserve estimates by any method. For us in the "Porosity-Acreage" method they show the geological conclusions as to the possible size of the gas reservoir, which is the acreage factor. For use in the shut-in pressure-delivery" method the gradually changing size of reservoir can be recorded by spotting the wet walls.

Nature, Classification and Porosity of Gas-Bearing Strata: Another unseen gas field factor is the reservoir itself, understanding of which is a function of subsurface geology. Strata that are favorable as reservoirs for natural gas are usually sand, sandstone, "granite wash," porous or cavernous limestone and dolomite. Sometimes a gas-bearing stratum is a combination of two or more materials. At times a gas-bearing stratum is found subdivided into alternate thin layers of sand and shale, often logged as "broken sand." Understanding of those strata and knowledge of the various ways they are recorded in drilling records is essential to the factors of porosity and productive thickness of stratum in the "porosity-acreage" method.

Since the gas is contained between the grains of sand or other material in the stratum, or in a cavity, the size of reservoir or cubical content is estimated by considering the percentage of porosity and the productive thickness and breadth of the gas-bearing stratum. Thickness is estimated from drilling records, breadth from the subsurface contour map.

Porosity is estimated by saturation of measured samples of the stratum with a measured liquid, usually water and sometimes under pressure. In cases of subcapillary, extremely tight pores, water would be slow to enter. In the complete absence of samples the porosity must of course be assumed, based on experience. An average and temporarily workable porosity would be about 20 per cent.

Conclusions

For sufficient accuracy to fill all needs in reserve estimating there is necessary a thorough scientific background applied to gas and a thorough understanding of practical gas field factors. Of the former there are plenty of authoritative data published; of the latter very little, it must at present be supplied mostly through contact.

NATURAL GAS MEN GIVEN COMPLIMENT

(Continued from Page 79)

structure of the time that has not a complete knowledge of its own picture. We cannot know where we are going unless we have the most accurate and most comprehensive information about our present situation. Full and accurate information undoubtedly impresses the potential market for our stocks and bonds and gives financial institutions more confidence in the stability and prosperity of our industry. It is just as important that we have the basic information upon which to base analyses so useful to all of us. Obviously, there is no way to secure this information except from our member companies. We ask you to remember this and to co-operate with us as completely as possible even when it inevitably means additional time and trouble to your own statistical departments.

The gas industry of America is today a great industry, fully united, of earnest purpose, of perfect confidence in a future so great that we can now scarcely visualize it and with resolute purpose to achieve our manifest destiny, furnishing the fuel of the world.

LIMITING FACTORS IN NATURAL GAS PROJECTS

(Continued from Page 94)

be expected for heating. The cooking and water heating super-imposed on this with allowance for the larger quantities used for such purposes in cold weather will make peaks for such a temperature on domestic gas about 555 feet per day per meter[1]. If rates for natural gas will be high compared to the fuels it replaces only a portion of the domestic heating may be obtained and the percentage that may be obtained is dependent upon the class of fuel to be replaced, its method of use and the character of homes. An estimate on this point is difficult and probably amounts to little more than an intelligent guess.

Load Factors

On the basis of a 25 degree minimum mean daily temperature, peak load of 555 feet per meter per day, 100 per cent house heating and a degree day efficiency per year of 1,000 the sales per meter would be about 16,000 cubic feet per year for heating, 25,000 cubic feet for cooking and hot water heating, 41,000 cubic feet total, giving a load factor of 20.25 per cent on domestic business. If the degree day deficiency be 2,000 per year then the heating sales become 32,000 cubic feet per year and the total sales 57,000 cubic feet per year and load factor for a 25 degree minimum day locality becomes 28.1 per cent. Near these limits are the load factors obtainable in southern and southwestern territory on domestic business.

The promoter is apt to give due consideration to unaccounted for gas in the distributing companies mains in setting up his market but prone to overlook it in making his allowances for the necessary revenues to the distributing company. Such losses will vary greatly both in percentage of sales and in cubic feet per mile of 3-inch main equivalent. They will seldom, however, be less than 15 per cent of the domestic business and will not ordinarily be varied greatly by

[1]Acknowledgment is due to R. M. Redding of Dallas Gas Co. for a very complete analysis of the characteristics of domestic loads in several southern cities.

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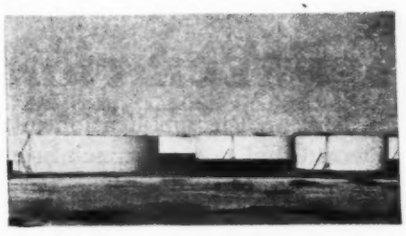

"Inspectors declared it 100% for gasoline storage"

IT was an 80,000 barrel storage tank—one of a number that were recently cleaned with the help of an Oakite cleaning solution for a large western refinery. This particular tank had formerly held crude oil, and before cleaning there were wax deposits nearly half an inch thick on certain sections of the interior.

But after the Oakite material had done its work the company's inspectors declared it to be "100% for gasoline storage." The tank was thoroughly clean—and equally important, not a minute's time was wasted in cleaning it. Only three days were spent on the entire job!

Such performance—this unequalled Oakite combination of speed and thoroughness—is available to you for *your* tank cleaning. Write for booklet "Oakite in the Oil Industry" and further details.

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changes in volume of industrial sales. They are thus actually a charge against domestic business. The volume of distribution unaccounted for is nearly free from seasonal or daily changes; it has practically a 100 per cent load factor and can be sold by the pipe line company for this reason at lower rates than any other portion of the gas delivered.

The promoter will next go astray in his optimism as to the ratio of consumers to population. This may actually vary through rather wide limits depending upon the size and character of the community. In large cities of predominantly white population it may run as good as 1 to 6 but in smaller communities, agricultural rather than industrial centers in the South, and in general where the negro population is relatively high no such figure is attainable as is evidenced by results of both manufactured and natural gas installations and by the experience of other utilities. The determination of this ratio requires careful investigation of the particular community to be served and any project is a risky one if such investigation has not been made. The promoter is usually also quite cheerful as to the growth of the communities and predicts a future growth from the past giving no consideration to the factors producing the past growth or to the reasons for expecting a continuance of that growth although there are indications that the influx of rural population to cities has begun to be reversed.

Industrial Use

In his estimates of the volume of industrial sales the promoter is apt to assume the nearly complete conversion of all industrial installations to a natural gas basis. This is seldom possible and then only in localities where the proximity of the supply enables sales to be made at prices well below that of competitive fuels. The competition from powdered coal in large plants close to coal fields is particularly hard to meet and in many instances can only be met on a dump load basis. The prices at which the business will prove profitable will depend upon the volume and load factor. Unfortunately the peak loads of industrial installations usually occur nearly simultanously, there is little diversity as to peaks. Further they usually occur at the peaks of domestic loads and if the industrial load is to be carried as firm business at prices comparable to competitive fuels capacity must be provided to handle both peaks simultaneously. The idea, however, has been quite prevalent that the equivalent price of competitive fuels could be obtained and yet the business be handled as an off domestic peak load. There are few communities in which the industrial load has a load factor of as much as 80 per cent and 70 per cent is more apt to be the figure.

If in a community the total yearly sales are S, M.C.F. of which domestic at M per cent load factor and unaccounted for at 100 per cent load factor constitute D per cent of the total, the unaccounted for being X per cent of domestic, and industrial sales on an N per cent load factor constitute 1 per cent of the total, then since total transportation charges, C, vary but little with variation in load, the relative portions of the total yearly transportation costs that must be borne by each of the three classes is

$$\text{Domestic} = \frac{CD}{(X+1)M} \div \left(\frac{D}{(X+1)M} + \frac{XD}{X+1} + \frac{I}{N}\right)$$

$$\text{Per M.C.F.} = \frac{C}{MS} \div \left(\frac{D}{(X+1)M} + \frac{XD}{X+1} + \frac{I}{N}\right)$$

$$\text{Unaccounted for} = \frac{CD}{X+1} \div \left(\frac{D}{(X+1)M} + \frac{XD}{X+1} + \frac{I}{N}\right)$$

$$\text{Per M.C.F.} = \frac{C}{S} \div \left(\frac{D}{(X+1)M} + \frac{XD}{X+1} + \frac{I}{N}\right)$$

$$\text{Industrial} = \frac{CI}{N} \div \left(\frac{D}{(X+1)M} + \frac{XD}{X+1} + \frac{I}{N}\right)$$

$$\text{Per M.C.F.} = \frac{C}{NS} \div \left(\frac{D}{(X+1)M} + \frac{XD}{X+1} + \frac{I}{N}\right)$$

For a domestic load factor of 25 per cent an unaccounted for volume equal to 15 per cent of the domestic and an industrial load factor of 70 per cent where the industrial load constitutes 50 per cent of the total yearly sales at city gate these costs per M.C.F. become as follows:

$$\text{Domestic} = \frac{C}{S} \times 1.588$$

$$\text{Unaccounted for} = \frac{C}{S} \times .3973$$

$$\text{Industrial} = \frac{C}{S} \times .5678$$

The combined load factor in the system will be

$$\text{Load Factor} = \frac{1}{\frac{D}{(X+1)M} + \frac{XD}{X+1} + \frac{I}{N}}$$

In the case assumed above this is equal to 39.7 per cent or the transportation system must be able to handle peak loads equal to over 2½ times the average load.

Operating Costs

Having determined the loads required to be carried considerable latitude may be had in selection of the size line and compression station spacing required to meet the conditions. It will be found in general in laying out systems that it is not economical to compress gas through high ranges of compression. In a flowing pipe line if the outlet pressure be one-third of the inlet pressure the square root of the differences in squares of inlet and outlet pressures is equal to about 94.25 per cent of the absolute inlet pressure and a reduction in outlet pressure to absolute zero pressure (14.7 pounds vacuum) could only increase the flow by 5¾ per cent. Now at three compressions in a compressor (ratio of absolute intake pressure to absolute discharge pressure) there is required 64 horsepower per million cubic feet of gas per day. At four compressions the horsepower per million feet is 84, an increase of 20 horsepower per million cubic feet per day of capacity. On this extra horsepower we would have operating cost about as follows:

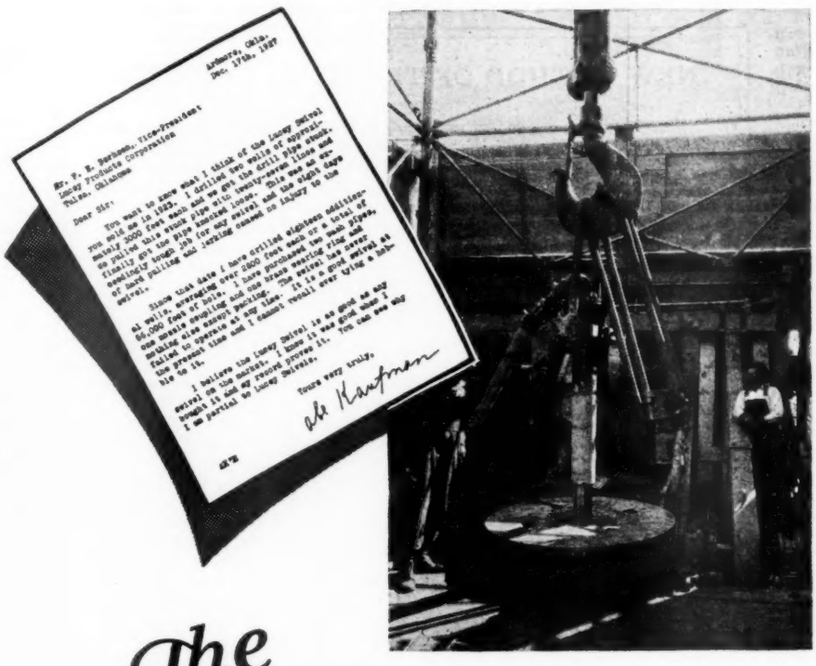
Labor and supplies, @ $6.00 ...	$120.00
Fixed charges, taxes return, maintenance and interest, 18% on $125.00, @ $22.50.....	450.00
Total per year on 20 H.P. additional	$570.00

If the load factor be 39.7 as in the preceding example then for each million cubic feet of capacity there are 397 M.C.F. × 365 = 144.800 M.C.F. yearly sales on which the added 20 horsepower has increased costs by $570 or .3935 cents per M.C.F. on all the gas handled and if there be two or more compressor stations the increase is two or more times this amount. As applied to increase in capacity of the line between a 3 to 1 and a 4 to 1 ratio, the line capacity has been increased from 94.25 per cent of its limit to 97 per cent of its limiting capacity or has been increased 2.92 per cent at an increase of 31.25 per cent in horse-

(Continued on Page 173)

LUCEY LUCEY LUCEY LUCEY LUCEY LUCEY LUCEY LUCEY LUCEY LUCEY

WHEREVER THERE'S OIL



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Bearing Case Always Clean

Absolutely no water or foreign matter can get into the bearing case, for it is made oil tight by a special, patented design of the wash down pipe. There are only two packing glands in the swivel, and these are easily adjusted from the outside.

Only High Grade Materials Used

All parts of this swivel are made of the highest grade materials, with special alloy steels for the vital parts. Packing glands are made of bronze, and hose connections and gooseneck of malleable iron. The bearings are guaranteed by the Timken Roller Bearing Company.

The Lucey Rotary Swivel is built throughout to give exceptional service, freedom from trouble, and save you time and money in upkeep. It is constructed according to A.P.I. specifications. Write for full information.

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Rapid Corrosion Test for Gasoline

Method Involving Use of Metallic Mercury Said to Have Several Advantages Over Copper Strip Test

By H. P. Rue[1]
Associate Refinery Engineer, Bureau of Mines, Department of Commerce

A 100-c.c. sample of the gasoline[2] drawn from the treater is placed in a clean 4-ounce sample bottle and 1 c.c. of metallic mercury added. The bottle is shaken uniformly for two minutes, and the gasoline decanted off and filtered at once through an 8-inch qualitative filter paper. The filter paper is then dried by an electric fan or by natural evaporation

The intensity of the black precipitate on the paper is a measure of the corrosiveness of the gasoline. A clean paper or one that is only slightly discolored indicates that the gasoline[3] will pass the copper strip test. If there is a heavy black precipitate on the paper and the sample is negative to the doctor test it indicates that an excess of sulphur over that needed to complete the reaction has been added and that the gasoline will be corrosive.

The operator or chemist may have to compare the mercury and copper-strip tests of a few samples to interpret the former in terms of the latter, but after a little experience he should have no difficulty with this. Five minutes usually is enough for completing the test. Thus the operator of the treating plant can know within five minutes from the time he starts his test whether or not he has added too much sulphur.

The mercury in this test can be used over and over again. When the mercury becomes dirty from particles of sulphides it may be cleaned by shaking with a few cubic centimeters of strong hydrochloric acid, washed with water, and dried on a filter paper, or it may be filtered through chamois. Tests can be made at regular intervals, and the filter sheets from the tests can be marked according to time and other data and posted on a board in the laboratory or at the treating plant; thus the chemist or operator can see at a glance how the treater is functioning and make changes to correspond.

The test seems to be more severe than the copper-strip test, as a perfectly clean paper is seldom obtained; but the range or gradations are much greater, which should allow much better control of the treating plant.

This test may also be used in testing the corrosion of gasolines that are too volatile to run by the copper-strip method. This method is not unlike that worked out by Ormandy and Craven[4] for the quantitative determination of free sulphur. While the method as used by them gave good quantitative results, it takes too long for plant-control work.

Discussion

Tests have been made at various temperatures from 25 to 70 degrees Fahrenheit to determine whether temperature had any effect upon the amount of precipitate deposited on the filter paper. The results of these determinations seem to indicate that temperature has little if any effect on the sensitiveness of the test, thus it can be made at any ordinary temperature.

A series of tests was made of samples of gasolines in which different amounts of free sulphur had been dissolved. The results show that the precipitate deposited on the filter paper is proportional to the amount of sulphur dissolved. The increase in the amount of the precipitate formed is much more pronounced than the variations in the color of the copper strip for the same test. The test does not require use of any special apparatus, and its simplicity is such that the operator of the treating plant should have no difficulty in making the test and interpretating the results.

Effects of Free Sulphur

Refiners all know that for the sodium plumbite reaction to be complete it is usually necessary to have free sulphur present. The following equations as established by Wendt and Diggs[5] will show why this is so.

$$2\,RSH + Na_2PbO_2 = \overset{RS}{\underset{RS}{>}} Pb + NaOH$$

$$\overset{RS}{\underset{RS}{>}} Pb + \text{Free Sulphur} = \overset{RS}{\underset{RS}{|}} + PbS$$

If the exact amount of sulphur necessary to complete the reaction is added it is all taken up by the lead, but if an excess is added it will dissolve in the product under treatment, usually causing it to be corrosive to the copper-strip test. This of course depends on the temperature and length of time at which the test is made.

The corrosion (copper-strip test of motor gasoline is usually made by submerging in it a strip of polished copper for three hours and holding the temperature at 122 degrees Fahrenheit. There are other variations of this, such as making the time one-half hour and temperature 200 degrees Fahrenheit or time three hours and temperature 200 degrees Fahrenheit. The three hours at 200 degrees Fahrenheit is the most rigid of the three. A comparison between these and different amounts of free sulphur is given in Table 1.

Interpreting Data

In interpreting the results of a corrosion test, more than extremely slight discoloration of the copper strip is called positive, but in the above table a distinction is made for the sake of comparison. It is evident from the above tests that the amount of free sulphur necessary to make a sample corrosive depends on the time and temperature at which the test is made. When the test was made three hours at 200 degrees Fahrenheit on the sample used in these determinations apparently some of the sulphur compounds decomposed, as the sample showed positive even though no free sulphur had been added.

Certain sulphur compounds such as the mercaptans will give the gasoline an offensive odor and usually will cause it to go off color on standing[6]. The doctor test is ordinarily used to detect the presence of these mercaptans, although other sulphur compounds will react positive to the same test. The effect of a few sulphur compounds on the color of gasoline standing in storage, together with the doctor test, is shown in Table 2. In the tests shown a few drops (about 1/10 c.c.) of the pure sulphur compound were added to each sample.

From the above table it is evident that the mercaptans give the greatest color drop in the sample of all the sulphur compounds tried. For this reason refiners try to treat them out or convert them to sulphides or disulphides.

Summary

A mercury corrosion test developed by the Barnsdall Refineries, Inc., at Okmulgee, Okla., is described. This test seems to offer possibilities, especially in the control of continuous sweetening plants using the sodium plumbite method of sweetening and in testing the corrosion of very volatile gasolines. It has been shown that when the copper strip test is run at 200 degrees Fahrenheit for a period of three hours smaller percentages of free sulphur in gasoline can be detected than when the test is conducted at lower temperatures or for shorter periods of time. It has also been shown that the mercaptans produce more discoloration of gasoline in storage than the other pure sulphur compounds used in these tests.—Reports of Investigations, Bureau of Mines, Department of Commerce.

NEW METHOD OF TREATING GASOLINE

For the proper control of gasoline treating plants there is need of a quick test for corrosion. In "sweetening" gasoline, that is, in treating it to remove evil smelling mercaptans or to convert them to disulphides or sulphides the sodium plumbite ("doctor") method is generally used. This method involves agitation of the gasoline with "doctor solution" (sodium plumbite made by dissolving litharge in a solution of caustic soda) in the presence of free sulphur. One of the common mistakes in the technique of this process is the addition of too much free sulphur, which will dissolve in the gasoline and cause it to be corrosive. In the operation of a continuous sweetening or treating plant, a check on the corrosiveness of the product is imperative at all times. The copper-strip test commonly used in specifications takes so long to perform that the plant may fail to function properly for some time before the operator discovers it.

The writer has investigated a rapid corrosion test method involving the use of metallic mercury, recently developed by Messrs. G. T. Granger, refinery superintendent, and A. B. Comstock, chief chemist, of the Barnsdall Refineries, Inc., Okmulgee, Okla. They have used this test successfully for several months in controlling the operation of their continuous treaters and have come to the conclusion that it has several advantages over the copper-strip test. Chief among these is the time saved, as the copper-strip test takes at least one-half hour, while the mercury test can be made in about five minutes. It is very evident that this is an important item in controlling a continuous treater.

TABLE 1—Corrosion and Doctor Tests of Gasoline Containing Different Amounts of Free Sulphur

Sample	Free Sulphur per 1,000 Bbls., Lbs.	Pct.	Copper-Strip Test 3 Hrs. at 200°F.	Copper-Strip Test ½ Hr. at 200°F.	Copper-Strip Test 3 Hrs. at 122°F.	Mercury Test	Doctor Test
1	0	0	Slight	Negative	Negative	Slight	Positive
2	5	0.0018	do	do	do	do	do
3	10	.0026	do	do	do	do	do
4	15	.0055	do	do	do	do	do
5	20	.0073	do	do	do	do	do
6	25	.0091	Negative	do	do	do	Negative
7	30	.0109	Just noticeable	do	do	This	do
8	35	.0127	do	do	do	and	do
9	40	.0146	do	Slight trace	do	following	do
10	45	.0164	do	do	do	samples	do
11	50	.0182	Slight	do	do	showed	do
12	55	.0200	do	do	do	very	do
13	60	.0218	do	do	do	black	do
14	65	.0237	do	do	do	precipitate	do
15	70	.0255	Positive	do	do	on filter	do
16	75	.0273	do	do	do	paper	do
17	80	.0291	do	do	do	do	do
18	85	.0309	do	Positive	do	do	do
19	90	.0328	do	do	Just noticeable	do	do
20	95	.0346	do	do	do	do	do
21	100	.0364	do	do	do	do	do

Based on gasoline with specific gravity of 0.754.

TABLE 2—Organic Sulphur Compounds in Gasoline

Sulphur compound—	Doctor Test	Color of Original Sample	Color at End of 6 Mos. After Adding Sulphur Compound
Thiophenol	Positive	21	—16
Allyl iso thiocyanate	do	21	— 2
Iso amyl mercaptan	do	21	Too yellow to take
N-Butyl mercaptan	do	21	do
Ethyl disulphide	Negative	21	4
Ethyl sulphide	do	21	25
Iso amyl sulphide	do	21	25

[1]Published by permission of the Director of the United States Bureau of Mines. (Not subject to copyright).

[2]Note: If this sample contains some suspended matter (known as hang-up) it should be filtered before the test is made.

[3]Note: If the doctor test of the sample before the corrosion test is made shows that it is still sour, of course it is evident that the treatment is not complete, and it will be necessary to make corresponding changes in the treater.

[4]Ormandy, W. R., and Craven, E. C., "Free Sulphur in Motor Fuels." Jour. Inst. Petrol. Technol., vol 9, No. 36, April, 1923, p. 133.

[5]Wendt, G. L., and Diggs, S. H., "The Chemistry of 'Sweetening' in the Petroleum Industry." Ind. and Eng. Chem., vol. 16, No. 11, November, 1924, pp. 1,113-1,115.

[6]Dow, D. B., Work cited.

TO ENLARGE STATIONS

It is announced that work will start at once on the enlargement of the Ottawa and Wichita compressor stations of the Cities Service Gas Co. in keeping with the recently announced purpose to complete its 20-inch Panhandle-Kansas City gas pipe line from Wichita to Ottawa, a distance of 130 miles, where it will connect with the main line system of the company supplying Kansas City, Topeka, Leavenworth, Lawrence, Atchison and other northern Kansas towns and cities. This work will consist of the construction of a 1,000-horsepower unit at each station, increasing the capacity of the Ottawa station to 5,000 horsepower and the Wichita compressor station to 3,000 horsepower.

According to present plans there will be six river crossings where multiple line construction will be used. These crossings will consist of three 12-inch lines. It is estimated this extension will be available by the latter part of September, making a direct line from the Panhandle area to Kansas City.

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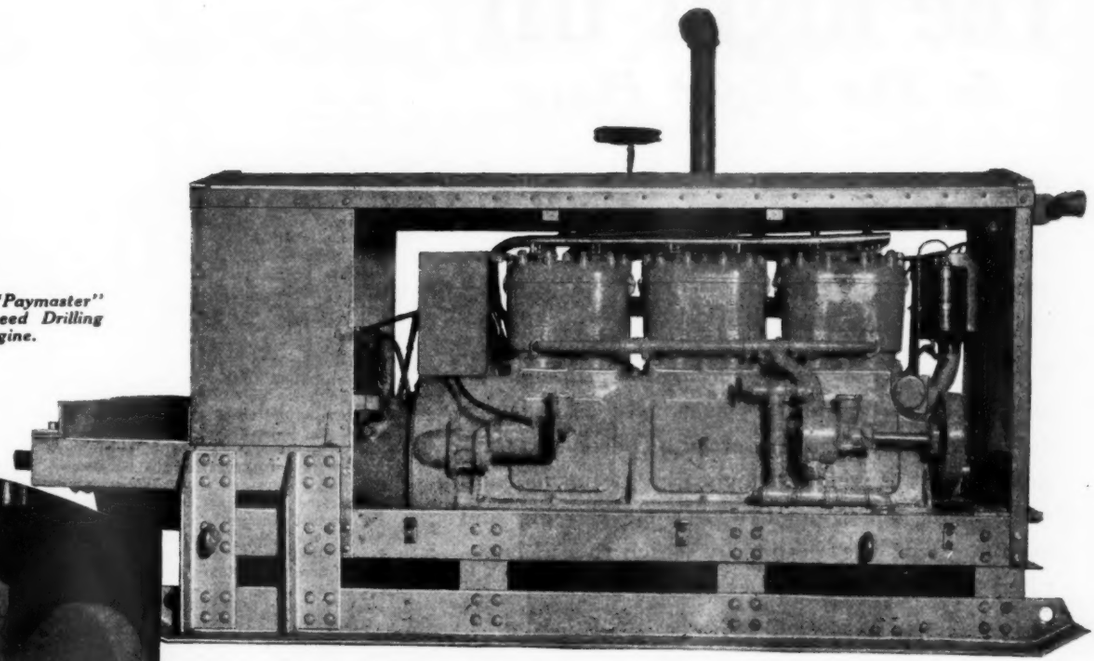

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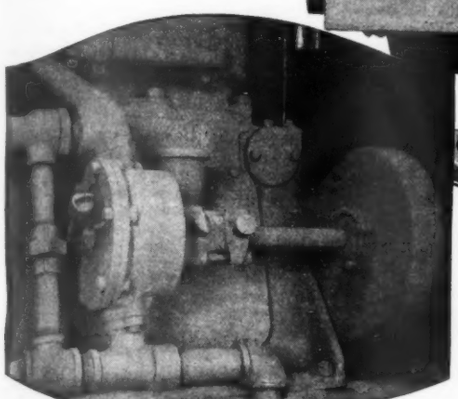

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PRESSURE BASE AND MEASUREMENT OF GAS AT DIFFERENT ALTITUDES

By D. A. Sillers*
Superintendent Gas Measurement, Lone Star Gas Co.

Gas measurement is the business of scientifically determining "how many," "what." Every gas company spends many thousands of dollars determining "how many." Many gas companies lose thousands of dollars because of a misunderstanding or a misinterpretation of the "what." The "how many" part of our business is very well taken care of. The trouble arises when we consider the "what." The cubic feet is the unit of measurement. Unfortunately there is no standard unit. Gas being compressible, a cubic foot of gas is a variable unit. For purposes of buying and selling, a definite unit must be decided upon. Therefore, in the sale or purchase contract, the unit to be used is defined.

A pressure base is part of the definition of the unit which is to be the basis of measurement. A pressure base determines the quantity of gas which is taken as the basic unit. A pressure base is entirely a matter of definition and contract, and is related in no way to atmospheric pressure or barometer. A pressure base is in a contract for the purpose of defining a constant unit. This purpose is defeated if the base is stated in terms of atmospheric pressure, which is in itself a variable at different locations through which the gas may be handled.

Elevation Makes Difference

For example take a cube of exactly one foot on a side. Fill it with gas at Dallas, Tulsa, or Pittsburgh until the pressure gauge shows 8 ounces and seal. We now have a cubic foot defined by the term "Pressure Base 8 ounces above 14.4 pounds absolute." Take this container with you to Amarillo, Denver, or Casper, and you will note that the pressure gauge will vary from the original 8 ounce reading to 2½ pounds or more. However, you still have the same quantity of gas, the same basic unit for sale or purchase. Some contracts are worded "Pressure base 8 ounces above atmospheric pressure." To sell one cubic foot of gas under this contract it would be necessary to break the seal, let out about 2 pounds of pressure or about 13 per cent of the gas, and sell this "short" cubic foot. This cubic foot could not be transported back to the first mentioned locations and sold as a cubic foot.

A pressure base stated in terms of "a pressure of (so many) (ounces or pounds) above 14.4 pounds absolute" is definite, as a definition should be, and is consistent with standard practice. It would be simpler to the technical man to state the pressure base in terms of absolute pressure only, but this would be confusing to the average operator, and stating the pressure as recommended conveys to all concerned a definite and familiar unit. Stating the pressure base in terms of variables such as "pressure above atmosphere," or "plus so many pounds per mile from compressor station," etc., is to be deplored as it does not define a definite or familiar unit.

Stating the pressure base as "so many ounces or pounds above an atmospheric pressure of 14.4 pounds" is not correct, as courts have held that if the actual atmospheric pressure is different from 14.4 pounds, then the actual atmospheric pressure must be used, and again we have the variable unit that was not intended when the contract was made.

Atmospheric Pressure

Contracts may contain the clause that gas volumes will be computed according to Boyle's Law. If this is omitted, it must be construed that the recognized laws governing orifice meter measurement will apply. If the atmospheric pressure differs materially from 14.4 pounds, it will be necessary to make a correction for this difference in the extension. The pressure base is a matter of agreement in the contract, but the atmospheric pressure to be added to the gauge pressure in determining the extension is a matter of fact, and the actual atmospheric pressure must be used. The usual extension book is computed using 14.4 atmospheric pressure. No one correcting factor can be applied to the coefficient, as the correction changes for every static pressure, the percentage correction being much larger for low static pressures than for high static pressures.

There are three methods of correcting the extension for an atmospheric pressure other than 14.4 pounds. One is to set the static pen low the amount of the difference. It is then necessary to check carefully that this is understood and always allowed for when testing and setting. Another method is to use a large slide rule on the market, which can be made up for any atmospheric pressure desired. The third method is used in Wyoming where the Bureau of Mines has made up extension books for several different altitudes. Either of the three methods will give the same result, the first method being the easiest and cheapest, but also the most liable to personal errors. There are companies that apply a "Barometric Base correction factor," and blindly trust to luck that this factor solves the whole problem, overlooking the fact that a first degree correction could not possibly correct a difference under the radical, and that in most cases this correction is in the opposite direction to that desired.

When the gas is measured through a positive meter with a pressure recording gauge, it is necessary that a new set of multipliers be made up, according to the following formula:

$$\text{Factor} = \frac{\text{(atmos. pres.)} + \text{(gauge pres.)}}{14.4 \text{ lbs.} + \text{(pres. base)}}$$

all expressed in pounds. The difference between the factors so computed, and the factors generally used at 14.4 pounds atmosphee is much greater at low gauge pressures than at high gauge pressures, and are much greater than the difference in orifice meter measurement as the factor is derived from an equation in the first degree.

Measuring Gas

The use of the foregoing recommendations will result in measurement, according to a definte, well understood unit, for all pipeline transmission purposes. The measurement of gas to the consumer by the local distribution company presents a problem in itself. Here the standard unit cubic foot can not be carried out, as all domestic and positive meters with no recording pressure gauges, of course, measure the gas in units of a cubic foot under line pressure above actual atmospheric pressure. This measurement may be brought to our standard unit by applying the factor:

$$\text{Factor} = \frac{.25 + \text{(actual atmos. pres.)}}{.25 \text{ lbs.} + 14.4 \text{ lbs.}}$$

(assuming 4 oz. line pressure) to all measurement. However, in practice the application of this factor to ever meter reading would be burdensome, but the factor could be reflected in the price charged per cubic foot. Where the distributing company sells gas through positive meters with recording gauges, or through orifice meters, the contact should specify definitely which pressure base is to apply, and it should be kept in mind that the factor given above is the ratio of the value of a cubic foot with pressure base above actual atmosphere, to the value of a cubic foot with pressure base above 14.4 pounds absolute.

To summarize:

1. A pressure base is the definition of the unit to be measured, and should be stated in definte and constant form.

2. Static pressure is a matter of fact, and is the gauge pressure plus the actual atmospheric pressure at the point of measurement, and the extension or pressure multipliers should be so computed.

3. There is no relationship between pressure base and static pressure, or extensions to be used at different atmospheres.

*Read before the Fifth Annual Gas Meter Short Course at the University of Oklahoma, Norman, April 24, 25 and 26.

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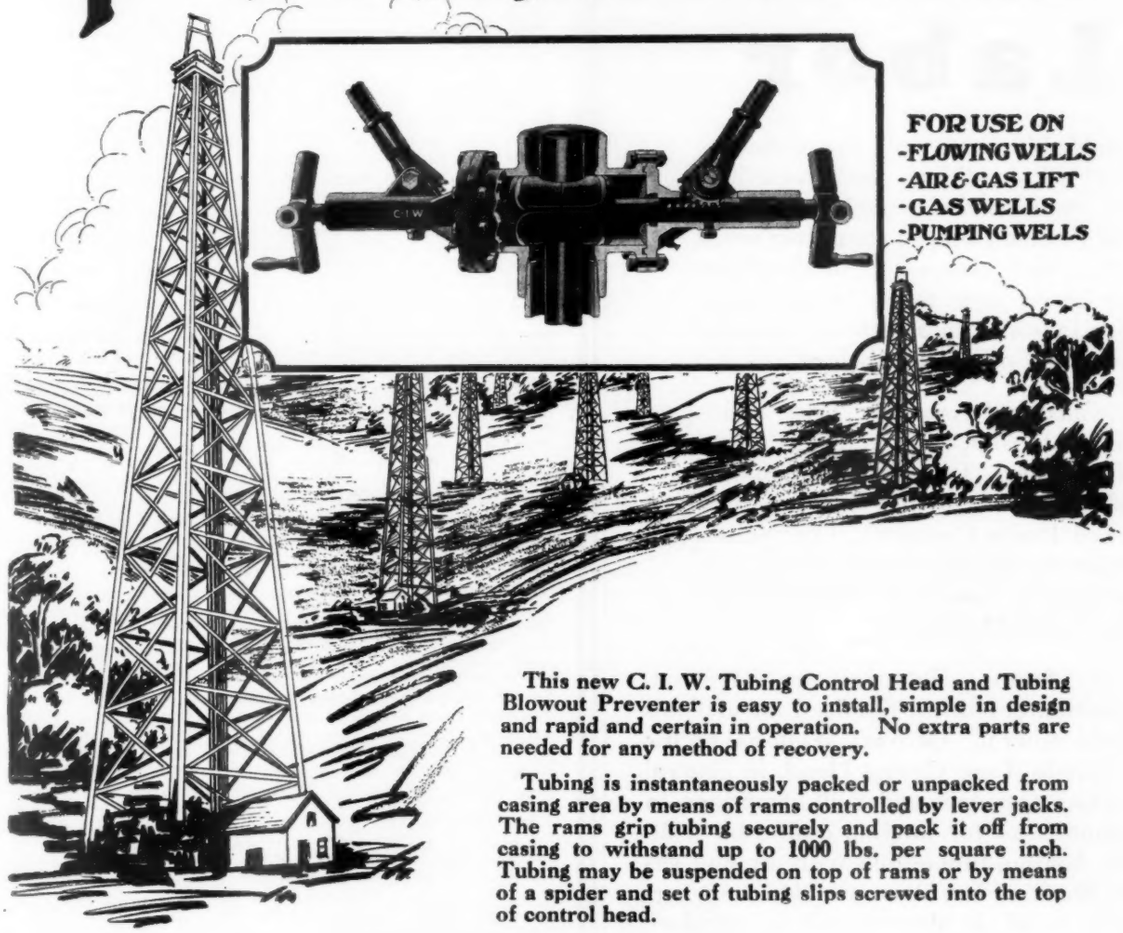

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(Continued from Page 66)

abandoned No. 8 R. B. Stratton farm, Section 34.

In Moulton Township, Auglaize County, the Ohio Oil Co. abandoned Nos. 1 and 2 on the William Walker farm, and No. 3 on the C. Naumburg farm, Section 15. W. Sprague and others are drilling a second test on the H. C. Whetstone farm, Section 27, Logan Township, same county.

In Allen County, Bath Township, C. A. Peavey is starting No. 6 on the C. M. Lenney, Section 1; B. L. Carman and others' No. 2 Martha J. Powell, Section 13, and H. F. Kelly and others' No. 4 on the J. M. Miller, Section 11.

Central Ohio

There were 11 completions reported from the Central Ohio Field, the best oil producer being that of the Logan Gas Co. in a test 300 feet from the north line and 960 feet from the west line of the R. E. Vanwinkle 76 acres, Section 14, Perry Township, Coshocton County. Sand in this test was found from 3,132 to 3,176 feet and drilled to a total depth of 3,182 feet, with an initial production of 143 bbls.

Late development work in the Cleveland Field in Cuyahoga County shows the county has some oil left in the sand to be recovered by the drill, a thing that is happening at this time while drilling for gas. In Strongville Township, George Beriswell's second test on the R. M. Ashley 99 acres, Lot 49, about 2 miles north and a little east of Strongville Village and a short distance northeast of the hamlet of Albion and about 3 miles or so southeast of the town of Berea, came in with an initial production of 60 bbls. from the Newburg sand. In Olmstead Township, same county, John Arthur's No. 1 on the L. Bainbridge 8 acres, Lot 23, is reported good for 30 bbls. initial from the Newburg sand. Mr. Arthur also drilled a dry hole 255 feet west of the township line and 195 feet from the south line of the G. Gage 47 acres, Lot 35. Hulse Kundtz brought in a very good gas well at a second test 450 feet from the north line and 275 from the west line of the A. W. Eldred 55 acres, Lot 29.

In Franklin Township, Summitt County, the East Ohio Gas Co. found a light gas well at a second test on the Robert Miller 162-acre farm, Section 28.

The Kemrow Co. brought in a fair gas well at a test on the Charles Shuy farm, Lot 13, Kilbuck Township, Holmes County. Same company is starting a well on the Walker Crosby farm, Richland Township, same county. Ohio Fuel Gas Co. made a location for a test 991 feet from the south line and 623 from the west line of the Altee E. Weaver 104 acres, Section 4, Paint Township, same county. In Hardy Township, same county, the East Ohio Gas Co. is reported to have staked out locations on the A. E. Harford, Samuel Franks and J. R. Hartings farm.

Ohio Fuel Gas Co. drilled in a light gas well at a test 750 feet from the south line and 1,300 feet from the east line of the Ernest Stratton 100 acres, Section 4, Congress Township, Wayne County. The Logan Gas Co. is drilling a test 660 feet from the north and west lines of the Peter Begley 80 acres, Section 17, Chester Township, same county.

In Brunswick Township, Medina County, the Ohio Fuel Gas Co. struck a dry hole at a test on the Charles M. Mix farm, Section 23.

Ashland County leads all other Central Ohio Counties in new work, owing to the activity shown in the Jeromesville Field of Perry and Mohican Townships, where good Berea sand wells are being found at very shallow depths. In Vermillion Township, the Ohio Fuel Gas Co. is drilling a test 660 feet from the north and east lines of the W. R. Jones 40 acres, Section 25, while the Logan Gas Co. staked a location for a test 560 feet from the north line and 600 feet from the west line of the S. E. McKinley 130 acres, same section. The Logan Gas Co. drilled in a good gas well at a test 660 feet from the north and east lines of the Lewis A. Balm 80 acres, Section 12, Clear Creek Township. A very good gas well was struck by the Kemrow Co. in a test on the J. M. Fluke 130 acres, Section 1 Orange Township, same county, the well being 600 feet from the highway and 425 feet from the west line of the farm. The Logan Gas Co. made a location for a test 1,200 feet from the north line and 660 from the west line of the Iva Benner 160 acres, Section 18, Orange Township.

Indiana

New wells are starting in various points in Indiana, although but one new completion was reported, which was a dry hole drilled by Perry Andrews and others, 400 feet from the north line and 200 feet from the east line of the S. N. Ingler farm, in the SW of Section 2, Madison Township, Pike County, in the Princeton district, in the southwestern part of the State. This test was drilled to a depth of 1,420 feet. In Clay Township, same county, the Murphy Oil Co. is drilling No. 9 on the Stewart Brothers farm, Section 13, and William Bell and others are working at a test on the Ross Lindsay farm, Section 31, same township.

Hartman & Sargent are shut down at their No. 3 on the Tillman Gaither farm, Section 22, Veale Township, Daviess County, as they are busy developing acreage in the Owensboro-Hartford Field, in the western part of Kentucky.

In Barton Township, Gibson County, also in the Princeton district, J. E. Baurs and others are drilling a test on the Burtis Burton farm, Section 9, and in Center Township, same county, Joe S. Young, Jr., and others are drilling No. 4 on the L. Jenkins farm, Section 13.

In Fairbanks Township, Sullivan County, the Siosi Oil Corp. is drilling tests on the E. Thompson and J. Johnston farm, Section 5. The Ohio Oil Co. is drilling a second test on the Rebecca Hopewell farm, same section, and the Twin Creek Oil Co. is drilling No. 2 on the Nora Williams, same section. Baldridge and others are drilling a test on the Sam D. Baum, Section 7.

In Prairie Creek Township, Vigo County, R. H. Hill and others are starting a test on the M. O. Whalen farm, Section 31; and Church and others are drilling No. 1 F. E. Shattuc, Section 32. Wilson & Marshall are drilling a test on the Ernest Blummett farm, Section 18, and the Siosi Oil Corp. is drilling Nos. 4 and 5 on the William Riggs No. 2 farm, Section 31.

Illinois

Two dry holes and a small producer were the completions in the Illinois Field for the week. In Johnson Township, Clark County, W. C. McBride, Inc., drilled in a dry hole in a test in the southwest corner of the Norman Bennett farm, in the NE of Section 13, also a dry hole in No. 29 well, 1,800 feet from the north line and 600 from the west line of the James Rush farm, in the NW of Section 25, Casey Township, at 1,400 feet. The Bennett well was drilled to a total depth of 1,585 feet, and both wells failed to find a pay in the Stray or Niagara formations.

In Southwest Township, Crawford County, the Ohio Oil Co.'s No. 3 in the northeast corner of the Dora A. Hipshire No. 3 farm, in the NE of Section 24, pumped but 2 bbls. from the Kirkwood sand, which was topped at 1,543 feet, and drilled through 13 feet of the sand to a total depth of 1,556 feet and shot with 40 quarts. In Dennison Township, Lawrence County, Phipps, Blosser and others are drilling a test on the J. J. DesBoeuf farm, Section 7. In Petty Township, same county, the Ohio Oil Co. is drilling No. 7 L. B. Nuttall, Section 25, and No. 20 on the Nancy J. Updike No. 2 farm, Section 35.

GUSHER IN PERSIA

A new oil well producing nearly 11,000 bbls. daily has been struck at Naft Khanah, about 80 miles northeast of Bagdad. The well is just across the Iraq border in Persian territory. It is outside the company's present field and is near the village of Heft Khel, 60 miles east of Ahwuz.

BAKER CEMENTING TOOLS—Left, Baker Cement Dump Bailer; Below, Baker Sure-Shot Cement Plug.

For Cable-Tool Operations

Proved in every field at all depths, *Baker* Tools will make *your* cementing jobs *safe and sure.*

Baker Cementing Tools are 'way past the experimental stage—they've been proved in hundreds of trying jobs at all depths in every field. Practical design and mechanical excellence have made them the choice of discerning operators everywhere. Put Baker tools to work on your cementing jobs—and be assured of a good job, well done, without unnecessary loss of time.

The Baker Cement Dump Bailer is the simplest dump bailer ever built for cementing. It never fails to dump—when it reaches the bottom, not before. Fluid pressure will not operate it. Nothing to get out of order—every working part is *forced* to operate precisely and positively.

The Baker Sure-Shot Cement Plug has been a dependable standby in cable-tool drilling for many years. Simple in operation—after the cement is dumped, the casing string is brought above the cement level, and the plug effectually seals the end of the string. Lowering the casing to its final landing forces the cement up around the bottom. After the cement sets, the plug is easily drilled up.

Write for the Baker catalog and learn more about these safe, positive-action cementing tools. Complete descriptions and instructions for using are incorporated.

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Technical Questions Answered

BY CHARLES K. FRANCIS, PH.D., TECHNICAL EDITOR

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible so as to assure a satisfactory answer.

All inquiries should be signed and if other than the given initials are to be used please indicate the desired letters.

Questions involving patented processes, intricate formulas and calculations and estimates of costs, for obvious reasons, cannot be answered. The replies will appear on this page within a reasonable time.

BUTANE AND PROPANE AS FUEL

We are interested in the possibilities of butane in bottled form for domestic fuel and understand that pure butane is not suitable in cold weather because it boils above the freezing point. Is it possible to mix propane with butane in some percentage so as to produce a mixture that would be suitable for use when the temperature is below zero?—R. F. Y.

The preparation of butane and propane for domestic fuel purposes is a recent development of the natural gasoline industry. It was early recognized in the industry that some portions of the gasoline produced were not desirable; the freshly made gasoline was wild, commonly known as high test gasoline, so that it had to be weathered before it was a commercial product and suitable for transportation. It was called wild because it was so volatile at normal temperatures that a large part of the liquid was quickly converted into gas with considerable boiling. The term high test was derived from the high gravity of the liquid. The industry had not perfected the operation so that a commercial gasoline was the first product, but the gasoline had to be evaporated or weathered for the purpose of removing the substances which passed into the gaseous form at normal temperatures. We do not hear so much about the weathering of natural gasoline today, but a new term has crept into the industry, that is stabilized gasoline.

The wild substances have been found to be butane and propane, which by means of modern apparatus are separated from the heavier, or less volatile, portions and saved in the liquid form. These are now being stored in special cylinders or bottles for use in connection with ranges and stoves as special domestic fuel.

Propane appears to be better adapted for use in sections where the temperature may go below zero because it boils at 49 degrees below zero, as compared with butane, which boils at 34 degrees above zero. This difference of 83 degrees suggests that small quantities of propane may lower the boiling point of a butane mixture sufficiently for some of the butane to be used at zero temperatures. Mixtures of these hydrocarbons behave similar to the natural gasoline mixtures above mentioned. When too much natural gasoline is added to a refinery gasoline there will be large losses without much lowering of the endpoint of the heavier product. Large quantities of propane, say something over 50 per cent, should be present in a butane propane mixture. The difference of 83 degrees is so great that there will be a considerable residue, let us say heavy end, when the mixture is used at zero, which must be considered a loss.

It is possible to arrange a bottle with a tube extending to the bottom so that a mixture of the two hydrocarbons will be withdrawn. By this or some similar arrangement it appears that mixtures of these substances may be used in bottled form. Direct use of the two products does not appear to be feasible, and a liquid which is essentially pure propane seems best adapted for use at low temperatures.

VENTURA CALIFORNIA CRUDE ANALYSIS

We wish to obtain reliable analysis of California crude from the Ventura Field and will appreciate if you can get this for us with the tests on each product?—D. B. E.

A complete analysis of Ventura crude has been published by Egloff and Morrell, from which the following has been arranged.

Crude Oil

Gravity	29.5
Cold test	22° F.
Sulphur	1.0%

Products Obtained

	Per cent	Gravity	Initial and End	Flash	Sulphur
Gasoline	31	54.7	128/433	...	0.06
Kerosene	7.3	38.1	387/527	165	0.35
Gas oil	19.8	30.6	514/777	...	0.77
Lube oil	12.3	22.7	Vis.@100 270	280	1.22
Wax	2.7				
Pitch	25	Melting point 120° F.			
Water	2.0				

A portion of the crude was reduced for the cracking tests; this topped crude tested: Gravity, 20.1; initial, 435; end, 740; cold test, 61 degrees Fahrenheit. The coke from the cracking operation contained about 10 per cent volatile matter, and had a heating value of approximately 15,500 B.t.u. The non-residuum type of operation yielded 60 pounds of coke per barrel, and residuum made 33 pounds per barrel. The gas produced by the two types of operation averaged 1,300 B.t.u. per cubic foot and amounted to 542 cubic feet per barrel charged for the non-residuum and 368 cubic feet for the residuum method.

CLASSIFICATION OF OIL ROYALTIES

Kindly give me your opinion on which classification oil royalties would come. Would you consider them securities or realty?—J. A. W.

A royalty, as used in the petroleum industry, is an interest in land. This is clear when we recall that in the early English law ownership of land was at the will of the crown and grants were made to members of the royal family and a few others who may have been in royal favor. These lands were worked by the commoner or tenant, who produced the crop at his expense while a part of the return was paid to those holding the royal title or fee. This portion or share to which the fee owner was entitled under the royal grant became known as the royalty.

An oil and gas royalty is the land or surface owners' part in the oil and gas that is produced. It is an interest that remains with a certain piece of land which may be stipulated, large or small, by a contract commonly called a lease. The ordinary royalty interest is one-eighth of the oil produced; this may be paid in the oil itself or in cash. The royalty interest in gas has in the past been fixed by the lease in many different ways. Some gas royalties are for flat sums but it appears more reasonable that the owner should be paid according to the return, so modern leases are providing a royalty for one-eighth of the gas sold at the prevailing market rate or some other rate mentioned in the contract. There is an additional return that may be had from some royalties and this is from the products that may be obtained from the gas. These are recognized in contracts for gas which is to be treated for the gasoline content or for the manufacture of carbon black.

A nonproducing royalty is the interest which is established by the landowner at the time of making the lease. It usually carries a cash consideration or bonus and a yearly rental for the life of the lease. The ordinary lease period is five years. The royalty interest may, of course, be changed every time a new lease is made. An oil and gas royalty may be a deed for a perpetual interest or simply a conveyance of an interest which will exist only during the period of a certain lease. An oil and gas royalty is not liable for the usual land taxes in Oklahoma, but some authorities are of the opinion that should the landowner fail to pay such taxes the owner of the royalty may have to pay them if he is to insure his interest.

It appears then that a royalty is a realty.

MOTOR FUELS FROM COAL

Will you kindly tell me what is the difference between low and high temperature carbonization of coal for making motor fuels? What other methods are proposed for making this kind of product?—G. B. R.

Low temperature carbonization is a relative term to distinguish it from the coke-making process, or high temperature carbonization. When certain soft coals are heated under proper conditions at temperatures between 800 and 1,800 degrees Fahrenheit, in most cases the temperature is close to 1,000 degrees, larger quantities of liquid are obtained than in the high temperature process used in the making of coke and gas. The temperatures in the latter are usually of the order of 2,000 degrees, and any liquid obtained is largely tar and cracked to an extreme degree. Special conditions are provided in the low temperature carbonization process so that there is not the excessive cracking and the liquid is suitable for a motor fuel when properly refined.

Similar products are made by the hydrogenation of coal. This involves the use of hydrogen, which combines with the carbon to form hydrocarbons. Another process is known as the synthetic fuel process. In this carbon monoxide is reduced, or converted to the hydrocarbon.

The motor fuel which is being made in Germany from coal is in a general way called synthetic gasoline. Although synthetic gasoline has been on the German market for several months, the average consumer has shown little interest in it. It is being supplied by Deutsche Gasolin A. G., which has also been selling an imported gasoline charged with iron carbonyl as an antiknock, and apparently the manufacturers have not wished to sell their synthetic product in competition with the imported petroleum products.

RICARDO HIGHEST USEFUL COMPRESSION RATIO

What is the origin of the term highest useful compression ratio which appears to be an indication of the knock value of different gasolines?—P. R. P.

The highest useful compression ratio is a term which was used by the English authority, Harry Ricardo in 1918, when he announced his investigations of the behavior of various fuels in the internal combustion engine. He was the first to direct attention to the specific nature of different gasolines with respect to their detonating or knocking property.

The highest useful compression ratios of various liquids which may be used as fuel in an internal combustion engine, are given, according to Ricardo, in the table below.

Liquid—	H.U.C.R.
Gasoline, non-aromatic	4.85
Kerosene	4 2
Cracked gasoline, 54% unsaturated	5 55
Pentane	5 85
Hexane	5.1
Heptane, normal	3 75
Carbon disulphide	5 15*
Benzol	6 90*
Toluol and Xylol	7 00
Cyclohexane, 93% pure	5 9
Ethyl alcohol, 98%	7 5
Methyl alcohol	5 20*
Butyl alcohol	7.3
Ethyl ether	3.9

*Preignition at this temperature.

Under standard conditions, using a variable compression engine he determined the point at which during increasing compression the engine gave the first audible signs of detonation. This point he designated the Highest Useful Compression Ratio, which is now commonly shortened to H.U.C.R., as being the highest compression ratio which could properly function with the fuel. If the compression ratio of the engine is raised above this figure, excessive detonation or knocking leads to preignition and loss of power.

This work, pointing out the fact of structural differences in gasolines, led to the investigations which have resulted in the preparation of antiknock gasolines.

RANCIDITY OF OILS AND FATS

Can you give me the method for determining rancidity of oils and fats which give a pink color in a solution?—N. R. L.

This is probably the phloroglucin test sometimes known as the Kreis test. The following is from an article by L. A. Spielman in The Chemist Analyst, February-March, 1927, page 7.

The sulphuric ether and phloroglucin used must be of the highest purity. Before using, the ether should be washed two or three times with a dilute solution of sodium hydroxide, then twice with water, separated and distilled. In selecting the phloroglucin for this test care must be taken that all the yellow or stained crystals should be removed and nothing but the pure white crystals used.

The test is carried out as follows: 10 c.c. of fat or oil placed in a large test tube (10 by 1) and 10 c.c. conc hydrochloric acid are added. It is now shaken well for 30 seconds to 1 minute and 10 c.c. of a 0.1 per cent solution of phloroglucin in ether are added and the tube shaken as before. The tube should not be closed by either cork or rubber stopper as these often tend to impart a slightly yellow or dark color to the contents in tube. A little practice will enable one to shake the tube well without spilling any. The whole is now allowed to settle. If the fat or oil is rancid a pink or red color will appear in the acid layer. With a fresh and sweet oil the acid layer is colorless. If the purity of the reagents is disregarded there is almost always obtained a yellow color in the acid layer which destroys the delicate pink upon which the whole test is based.

Mr. Spielman makes the following comments:

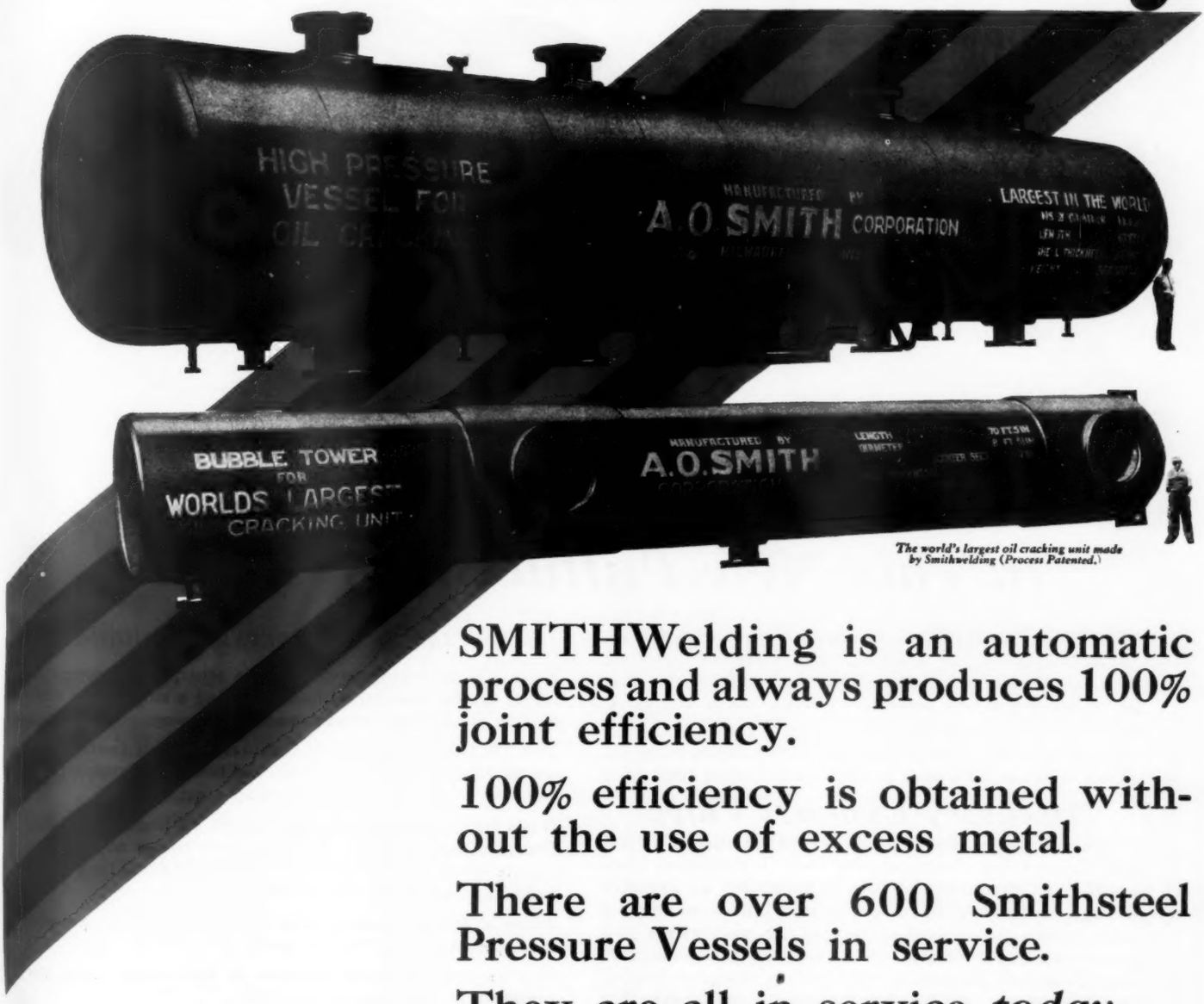
1. All rancid oils and fats give a definite pink coloration in the acid layers.

2. Freshly refined sweet fats give a negative result, except in some cases of cottonseed oil which shows a trace of pink even though refined and apparently sweet.

3. The intensity of reaction is roughly proportional to the degree of rancidity.

4. If a fat gives a slightly pink coloration in the acid layer but does not smell or taste rancid it may be said to be in a state of incipient rancidity and the above-mentioned physical characteristics are in process of development.

100% Joint Efficiency



The world's largest oil cracking unit made by Smithwelding (Process Patented.)

SMITHWelding is an automatic process and always produces 100% joint efficiency.

100% efficiency is obtained without the use of excess metal.

There are over 600 Smithsteel Pressure Vessels in service.

They are all in service *today*.

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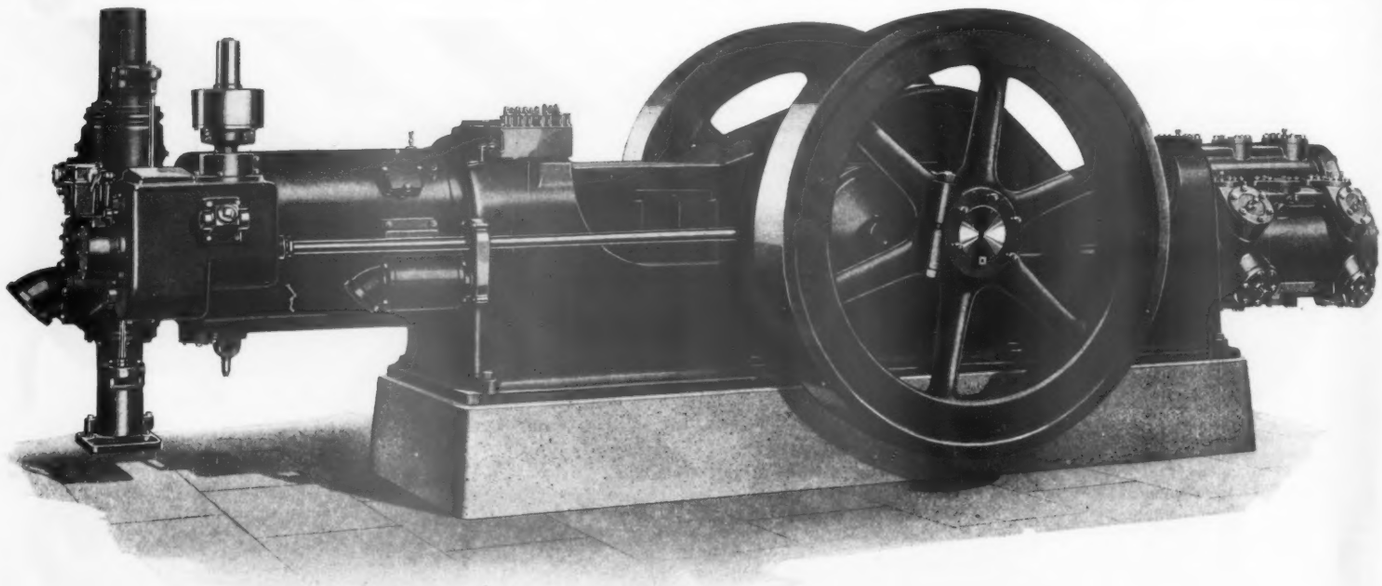
Valve Trouble Eliminated



In This New Pattin Super-Power

THIS new 100 H.P. Direct Driven Compressor carries an Auxiliary Exhaust Valve that practically eliminates all valve trouble. It embodies features that stamp it as a unit far in advance of any heretofore offered, and it will carry the full rated horse power load.

It is a four cycle, single acting, center crank type, fully enclosed, with two fly wheels and has the following features—

Auxiliary Exhaust Valve

The main feature of our new engine is an Auxiliary Exhaust Port Sleeve Valve, (Patent applied for). It eliminates valve trouble. As practically all fire is taken out of cylinder through the center of this sleeve valve, and does not come in contact with the finished surface of the main valves, the greatest wear is eliminated. After exhaust takes place, this valve closes, and prevents loss of incoming charge or fouling by exhaust gases. No fire goes through the main valves.

Assembly of Compressor Cylinders

Each cylinder is independent of the other. The pistons or valves can be removed without changing a single pipe connection or affecting the alignment in any way.

This 100 H.P. Direct Driven Compressor is self contained—one foundation, and has no outboard bearing or supports of any kind to get out of line and cause trouble.

It has high speed governor, gear driven, enclosed; renewable Phosphor Bronze Main Bearings, with wedge adjustment, completely enclosed combination splash and force feed lubrication, and automatic air starter.

A special feature has been built into this unit, which permits it to operate on very lean air gas.

It is destined to be the sensation of 1928—write today for literature on this Super Power Unit.

Suitable for Gas Booster work—any pressure from 50 to 400 pounds.

Equipped With MEISTER VALVES

Meister Valves are made of vanadium steel and weigh less than two ounces each. On account of their lightness they are absolutely noiseless and will never require grinding.

Seats are made separate from cylinder and are readily accessible for cleaning or repairing without removing a single connection. As they are free from troublesome springs, they can be used in any position. Here are some features of Meister Valves.

1—Improved mechanical and volumetric efficiency over the old style poppet valve.
2—Elimination of lubrication of any kind for the valve itself.
3—Silent operation at the highest piston speeds.
4—Valves never require regrinding.
5—Elimination of troublesome springs.
6—Simplification of air end, owing to the absence of all complicated valve operating mechanism.

Write for prices, or inquire of any of our representatives.

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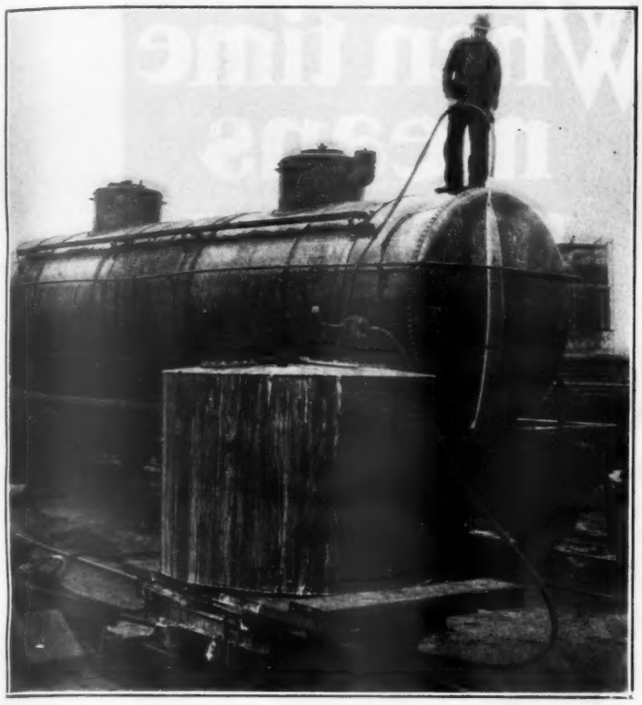
METHOD OF CLEANING EQUIPMENT SHOWN IN PICTURES ON SCREEN

Speaking before the Purchasing Agents Association of Tulsa, A. J. Ospring of Oakite Products, Inc., threw on a screen a series of pictures showing the operation of cleaning oil-industry equipment and the sharp "before" and "after" contrasts. The talk with accompanying pictures, covered the problems of cleaning as they are found in the petroleum industry, from salvage parts, such as valves, nipples, etc., to tank steamers. He described how a duplex pump, weighing 6,000 pounds, is cleaned inside and outside in about an hour by immersing it in a vat of Oakite solution. He asserted that by the old primitive methods of cleaning it would have taken two men three days to clean such a pump, and that even then the job would have been done imperfectly. Small parts, like bolts and nuts, are put in a wire basket and lowered into the vat.

For cleaning large pumps and other equipment without dismantling them, the cleaning solution is applied with a steam gun or a compressed-air hose. Storage tanks and tank cars must be cleaned, or "stripped," of their old paint with a solution specially made for the purpose. Then they are repainted. Sometimes large storage tanks are dismantled and the sheets are cleaned separately.



This picture was taken while a workman was cleaning, or "stripping," a tank car of its sundry layers of paint and dirt.

And here's how the same car looked after it had been cleaned and dolled up.

EASTERN FIELDS

(Continued from Page 70)

In Sheridan district, Calhoun County, the Chemical Oil Co. has started to drill on the Ellen B. Yoak farm. In the same district, Thomas Crowley & Co. have started to drill on the Archer-Bruner farm. In Church district, Wetzel County, the Monongalia West Penn Electric Co. is drilling deeper its test on the George Renner farm.

Southwest Pennsylvania

In Dunkard Township, Greene County, J. J. Vanvorhis has completed a test on the Nimrod Johns farm. It is a fair gasser in the Gordon sand.

PATRICK CARBON
for Diamond Core Drilling

"Specify Patrick Carbon"

THERE is extra service in PATRICK CARBON that every diamond core drill operator is invited to enjoy. It is included without additional cost with every order for Patrick Expertly Graded Carbon.

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Play Safe With Champion Drop Forged Parts

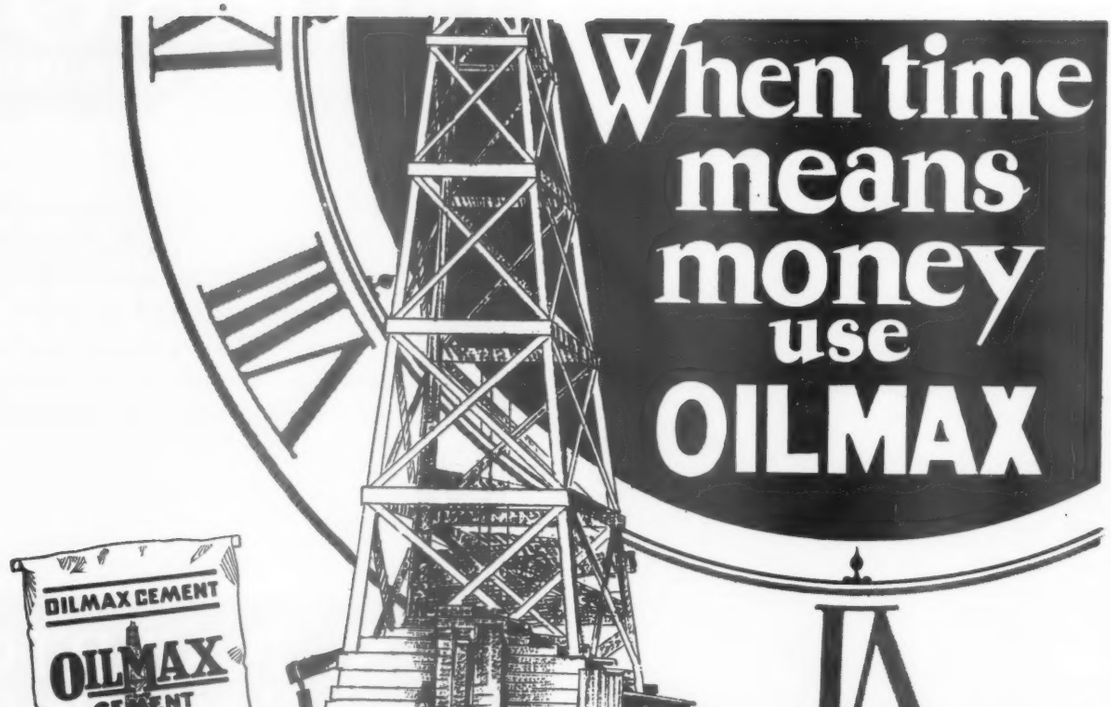
IT doesn't pay to take a "Brody" with weak-kneed equipment in the production end of the oil racket. Odds are against high production figures with such machinery because invariably it falls down on the job—the delays, replacement charges and high repair costs soon eat up the profits.

Production men who hang up real records play safe with Champion Drop Forgings for the vital, load-bearing parts of their production equipment. They know that the tough, give-and-take strength of Champions insures steady, consistent production service twenty-four hours every day.

Specify Champion Drop Forgings for all replacement parts and particularly on all new production equipment.

THE CHAMPION MACHINE & FORGING CO.
Cleveland, Ohio

CHAMPION DROP FORGINGS



WHEN a six to ten-day drilling delay means loss of production and holding up of high priced labor—that's when you need Oilmax Cement. And that's when it will prove its time and money-saving dependability.

You can resume drilling operations 48 hours after your casing has been set with Oilmax! It eliminates costly delays when used in shutting off water, straightening crooked holes, plugging back, cementing off lost tools, filling cave-ins or caves and all difficult bottom hole work. Because, used neat only, it gets as hard in 24 hours as Portland Cement in ten days—*and requires no admixtures or accelerators.* With a uniform mix, made easy because only water is added, weak or soft spots are eliminated.

Oilmax is specially compounded to set up normally in salt water or water containing oil, sodium chloride, magnesium chloride or calcium sulphate. But it is *not* quick setting. It takes its initial and final set just like Portland Cement, allowing ample time for mixing and placing, no matter how deep the hole.

Oilmax is a true Portland Cement, meeting all Govt. and A. S. T. M. specifications. It is unusually plastic, slips easily and quickly and works equally well in bailer and pump.

Available through dealers... You can secure Oilmax Cement through legitimate retail dealers. Packed in sturdy 5-ply paper bags, it may be shipped in mixed cars with Ash Grove Portland Cement or Quikard Cement. If your dealer doesn't stock it, write us for complete information.

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OILMAX CEMENT

19

LIMITING FACTORS IN NATURAL GAS PROJECTS

(Continued from Page 160)

power. If the line be of 1,000 M.C.F. per day capacity at a 3 to 1 pressure ratio it would then be of 1,029.2 M.C.F. per day at 4 to 1 pressure ratio and if with two compressor stations the horsepower would be increased from 128 to 168 at an added yearly cost of $1.140. The increased capacity of 29.2 M.C.F. per day on 39.7 per cent load factor would amount to 4,225 M.C.F. per year at a cost on the increase for compression of 27 cents per M.C.F.

Few if any distribution systems can exist on less than the equivalent of $7.50 per year per customer plus 25 cents M.C.F. distribution charge on domestic gas and 2 cents per M.C.F. distribution charge on manufactured gas. If the distributor has a manufacturing plant investment to wipe out he may need $6 to $8 per year per meter in addition to the above to prevent loss of the investment in the manufacturing plant.

Use of Data Illustrated

As an example, assume a city 300 miles from the gas supply with minimum temperature of 25 degrees and 1,000 degree days deficiency per year below 65 degrees Fahrenheit, a population ultimately to be provided for of 300,000 and a volume of industrial business apparently ultimately obtainable of 7,000,000 M.C.F. per year.

Peak Loads:

Domestic: $\frac{300{,}000}{6} = 50{,}000$ consumers.

(a) Cooking and water heating per meter per day.

$$\frac{25{,}000 \times 1.1}{365} = 75 \text{ cubic feet}$$

(b) Space heating per meter per day.

$(65 - 25)16 = 480$ cubic feet

	C.F. per day
Total Domestic Peak: 50 meters at 555 C.F.	27,750,000
Industrial: $\frac{7{,}000{,}000}{365 \times .70} =$	27,400,000
Unaccounted for: (See sales below) $\frac{307{,}500{,}000}{365} =$	843,000
Total peak load per day	55,998,000

Size of Lines and Compressor Stations

Another example: An 18-inch line 150 miles between compressor stations has a capacity of 400 pounds of 54,750 M.C.F. per day. It may be selected for a preliminary set up and pressure raised slightly above 400 pounds in final design to secure the small additional capacity required for markets, compressor station fuel, and line loss. If stations be spaced 100 miles apart we are still confined to an 18-inch line for the capacity required if we hold to a 400-pound limit but may use a 16-inch line by using 500 pounds pressure. By spacing stations about 75 miles apart we can use a 16-inch line at 400 pounds pressure. To determine the selection let us find the relative costs of operating as follows:

A—18-inch line, 300 miles, two 150-mile sections, 2 compressor stations, 400 pounds.
B—16-inch line, 300 miles, three 100-mile sections, 3 compressor stations, 500 pounds.
C—16-inch line, 300 miles, four 75-mile sections, 4 compressor stations, 400 pounds.

Case A—Horsepower required at 3 compressions is 65 H.P. per million × 56,000,000, or 3,584. Allowing for spares, install 4,000 H.P. per station.

Operating costs per year:

Line—300 miles of 18-inch—400 pounds @ 10,000 pounds tensile stress @ $5,010.00 per mile	$1,503,000.00
Extras—(See investment)—18% on $500,000.00	90,000.00
Compressor stations—2 @ 4,000 H.P. each @ $32.50 per H.P.	260,000.00
Total operating costs except management and gas	$1,853,000.00

Case B—Horsepower required at 3 compressions is same as Case A—4,000 H.P. per station.

Operating costs per year:

Line—300 miles of 16-inch—500 pounds @ 10,000 pounds tensile stress @ $4,950.00 per mile	$1,485,000.00
Extras—(See investment)—18% on $500,000.00	90,000.00
Compressor stations—3 @ 4,000 H.P. each @ $32.50 per H.P.	390,000.00
Total operating costs except management and gas	$1,965,000.00

Case C—Horsepower required at 3 compressions is same as Case A—4,000 H.P. per station.

Operating costs per year:

Line—300 miles of 16-inch—400 pounds @ 10,000 pounds tensile stress @ $4,210.00 per mile	$1,263,000.00
Extras—(See investment)—18% on $500,000.00	90,000.00
Compressor stations—4 @ 4,000 H.P. each @ $32.50 per H.P.	520,000.00
Total operating costs except management and gas	$1,873,000.00

The difference between A and C is small, but C has a slightly larger actual capacity and is selected for that reason.

Investment

Pipe line—300 miles of 16-inch—400 pounds @ 10,000 pounds tensile stress @ $25,500 per mile	$7,650,000.00
Compressor stations—4 @ 4,000 H.P. @ $136.50 per H.P.	2,184,000.00
Extras for streams and unusual conditions	500,000.00
Total cost including overhead	$10,334,000.00

Sales

Domestic:	M.C.F.
(a) Cooking and water heating—25 M.C.F. × 50,000 consumers	1,250,000
(b) Space heating—1,000 deg. days × 16 feet × 50,000 consumers	800,000
Total domestic	2,050,000
Unaccounted for @ 15 % of domestic	307,500
Industrial	7,000,000
Total sales	9,357,500

Transportation Costs

Case C—300 miles of 16-inch—400 pounds—10,000-pound line @ $4.210.00	$1,263,000.00
10,000 H.P. of compressors @ $32.50	520,000.00
18% on $500,000.00 extras	90,000.00
Total except management and gas	$1,873,000.00
Management ¾ cents per M.C.F. on 9,357,500 M.C.F.	70,100.00
Total transportation costs	$1,943,100.00
Average per M.C.F. on 9,357,000 M.C.F.	20.8c

Transportation Charges Per M.C.F. Classified

Proportion of domestic and unaccounted for sales to total	25.2%
Proportion of unaccounted for to domestic sales	15.0%
Proportion of industrial sales to total sales	74.8%

$$\text{Domestic Load Factor} = \frac{2{,}050{,}000}{27{,}750 \times 365} = 20.25\%$$

Unaccounted for Load Factor..... 100.00%

Industrial Load Factor..... 70.00%

Domestic: (Eq. 2)

$$\frac{\$1{,}943{,}100.00}{.2025 \times 9{,}357{,}500} \div \left(\frac{.252}{(.15+1).2025} + \frac{.15 \times .252}{.15+1} + \frac{.748}{.70} \right) = 46.92c$$

Unaccounted for: (Eq. 4)

$$\frac{\$1{,}943{,}100.00}{9{,}357{,}500} \div \left(\frac{.252}{(.15+1).2025} + \frac{.15 \times .252}{.15+1} + \frac{.748}{.70} \right) = 9.505c$$

Industrial: (Eq. 6)

$$\frac{\$1{,}943{,}100.00}{.70 \times 9{,}357{,}500} \div \left(\frac{.252}{(.15+1).2025} + \frac{.15 \times .252}{.15+1} + \frac{.748}{.70} \right) = 13.58c$$

Cost of Gas at City Gate

To the above must be added the price per M.C.F. in the field. The loss in transportation and compressor station fuel having been allowed for in the respective operating cost figures.

CALIFORNIA FIELDS

(Continued from Page 64)

ident of the American Petroleum Institute, has just issued a rather comprehensive report covering the work undertaken and the results accomplished, and if the report of the subcommittee, working under the auspices of the California State Mining Bureau and Chamber of Mines & Oil, is followed out the production of oil and gas will become relatively stable and permit the industry to regulate the supply to conform to demand and prevent recurrent periods of excessive overproduction with consequent low prices and insure a longer future supply of petroleum products. A study of California fields shows that frequently wells with the highest gas oil ratios are near the crest of the anticline, or dome, whereas wells out on the flanks of the structure have low gas oil ratios This lack of uniformity renders conservation work extremely difficult in many instances, especially where a high gas-oil ratio well of one operator is located in close proximity to a low gas-oil ratio well of another operator. This situation is especially true in the prolific Ventura Avenue Field but the conservation committee did, nevertheless, succeed in reducing the natural gas production of this field approximately 40,000,000 feet per day by shutting in about 10,500 bbls. of light oil daily as a result of the splendid cooperation of the companies operating in that district.

The gas conservation committee made a very comprehensive survey of the production and demand for natural gas in California and sponsored the arrangement which was made between gas distributing companies and the Standard Oil Co. whereby the latter would store surplus gas in the Coyote Hills Field for delivery at a later date. Approximately 50,000,000 feet of dry gas has already been delivered by the gas companies to the Standard and this has been injected into the formations at Coyote Hills through two wells under a pressure of approximately 400 pounds. The storing of this gas during peak periods of production will increase the total recovery of gasoline upon recovery of the stored gas and stabilize the production of natural gas by making this available as a gas reserve upon which to draw during the winter months when gas consumption is at its highest point. The best-known example of gas injection for the purpose of increasing the oil recovery is being conducted by the Union and Shell by mutual co-operation in the Dominguez Field. These operations have extended over a period of more than a year and a half, during which time over 2,000,000,000 feet of gas has been injected through six wells under an average pressure of 550 pounds. Comparisons of normal decline curves of certain wells constructed on the basis of initial productions with actual production curves shows clearly that the operations have resulted in a substantial increase in the recovery of oil.

Gas Increases Recovery

The Shell has also experienced considerable success through the utilization of gas for recovering gasoline, a considerable amount being secured from unrecoverable oil in the Coalinga Field of Fresno County. Dry gas was injected into the oil sand through one well under a pressure of approximately 40 pounds and recovered with approximately 1 gallon of natural gas gasoline per 1,000 feet from surrounding wells. The gasoline thus recovered is undoubtedly absorbed from the oil adhering to the sand grains as these wells have been pumping for about 15 years and the fluid levels now stand far below the top of the sand stratum so that the oil production now comes from the lower and less depleted part of the zone. The production of crude oil was not stimulated as a result of these operations because the gas by-passed through the upper drained part of the zone but it is believed that if a sufficient quantity of gas were available to build up the entire structure by filling up the voids in the sand the production of crude oil would be consequently increased.

The gas committee of the general conservation committee has laid particular stress on the importance of natural gas in the production of crude and the necessity of proper control in its use in order to effect the greatest ultimate production of crude oil at the least cost. Back pressure control is the recognized means of obtaining maximum recovery efficiency which is indicated by the amount of gas produced with each barrel of oil. Gas oil ratio control is not only advantageous to operators by effecting greater recovery of oil but also conforms to the public demand for the conservation of gas. The primary objects of gas injection as sponsored by the conservation committee is to increase the recovery of oil, permit the storage of surplus gas in suitable fields during periods of high production and stimulate the production of gasoline from unrecoverable oil.

Long Beach to 180,000 Bbls.

Daily production of the Long Beach Field was pushed up to approximately 180,000 bbls. during the current week as a result of the completion of another group of deep-zone wells and from present indications the output of this field will probably top 200,000 bbls per day within the next several weeks. There are 192 new wells and deepening projects headed down for the lower horizon, a large number of which are scheduled for completion during the next three or four months. These wells, while they will not register as high an initial production as current completions, should, nevertheless, offset a large part of the normal decline and consequently prevent any very appreciable drop in production

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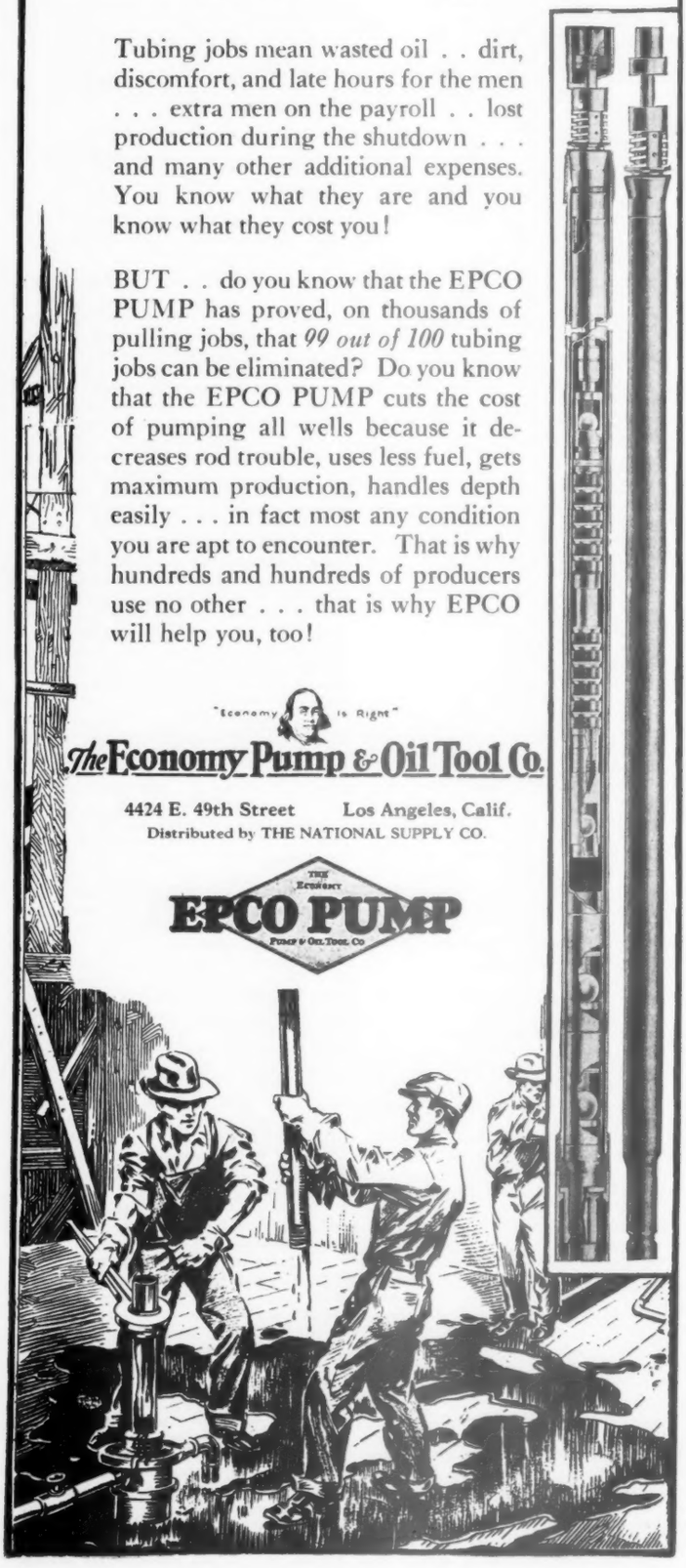
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immediately after the 1928 high has been attained. It is unlikely, therefore, that the daily production of the Long Beach Field will drop below 150,000 bbls. within six months. The Potrero Field is not expected to become an important factor during the present year although several additional producers will probably be completed before 1929.

The Rincon Field of Ventura County, on the other hand, is expected to register increased production if the projected lower horizons prove highly productive, although this depends entirely upon the productivity of this deeper zone. If the exploratory work now under way at Rincon proves successful, as expected, operators will probably chalk up about 20 new wells within 90 days after completion of the initial deep-zone well. This might result in an increased production in this field of from 10,000 to 50,000 bbls. per day, depending upon the initial production. The intensive development campaign along the ocean front can be counted on to f u r n i s h some fast-drilling records, as the proximity of wells is bound to result in competitive drilling. That operators realize this condition is evidenced by the fact that the Pan American, Chanslor-Canfield Midway Oil Co., Standard, General Petroleum, Miley Oil Co. and others all have several wells under way, notwithstanding that this extensive work is unjustified as far as the potentialities of the shallow zones are concerned.

It is evident that operators developing the Rincon Field have been marking time in an effort to delay the period of competitive drilling which is bound to result immediately following completion of the first large producer but they are, nevertheless, drilling ahead slowly in order that no time might be lost in taking advantage of any deep production opened up. This accounts for the fact that many of the drilling projects at Rincon are down only to around the 3,500-foot level, notwithstanding this work has extended over several months. It is not likely the Ventura Avenue Field will cause California producers any embarassment during 1928, although the daily output could be stepped up at least another 100,000 bbls. The conservation work recently undertaken and the large production resulting from deep-sand exploitation at Long Beach should tend to retard development work at Ventura Avenue. None of the other local fields are expected to exceed current production as a result of additional development work although some of the present curtailed production may be opened up later.

Potrero

The Associated is putting the finishing touches on four 5,000-bbl. steel tanks in the new Potrero Field, between Inglewood and Rosecrans in the Los Angeles Basin and No 2 Cypress, the company's first commercial producer in this area, which showed a potentiality of better than 1,000 bbls. daily will be given a conclusive flow test extending over several weeks, to determine the probable rate of decline subsequent to completion. No. 1 Cypress, which blew out a short time after the completion of No. 2 and ran wild for several days, will be worked over and an attempt made to locate the origin of the gas responsible for this unexpected blowout. The point of entrance is not definitely known although some are inclined to believe a dry gas zone was unintentionally cemented off somewhere around the 5,000-foot level or mudded off during the work. This well blew in flowing between 15,000,000 and 20,000,000 feet of gas daily and would prove an excellent grade of industrial fuel if present in sufficient quantities to warrant development. The completion of No. 2 Cypress as a successful commercial producer by the Associated has resulted in considerable leasing activities both north and south of the well purely from a speculative nature, although some of the tests scheduled to be started within 90 days may come into productinn. Operators in the Alamitos Heights Town Lot section of the Seal Beach Field received a surprise a few days ago when No. 1 Horowitz of the California Eastern Oil Co. blew in flowing approximately 20,000,000 feet of gas daily, the roar being audible for more than a mile. This well was originally completed in June, 1927, as a 1,445-bbl. producer from 4,820 feet and recompleted four months later doing 940 bbls. daily upon being deepened to the 5,420-foot level. It subsequently went off production, and the company decided to undertake some additional work to stimulate production. The well was brought in under perfect control although it was permitted to blow off temporarily until the extra heavy equipment could be reinforced.

Long Beach

The General Petroleum chalked up another successful completion in the Long Beach Field early in the week by bringing in No. 4 Clock flowing 1,995 bbls. of 29.8 gravity oil daily from the 6,840-foot level, and four more wells, No 3 Black & Drake, No 5 Boyer Kelley, No. 7 Boyle Perry and No. 8 K. & H., should be on production within 10 days. The California Petroleum should also list several new wells in the near future and this company, second only to the Shell in productive acreage, will spud in three new wells. The Richfield Oil Co. concluded drilling operations on No. 6 Denni at 7,401 feet and this well, the deepest in the Long Beach Field, is scheduled for a production test within a day or two. The Richfield will probably only finish a relatively small number of wells in the deep zone during the next two or three weeks but will probably chalk up 8 or 10 during June or later in May.

The Shell is in somewhat the same position as most of the 42 deep-zone wells under way at Long Beach are above the 5,000 foot level, although Nos. 30 and 31 on the Alamitos lease, No. 7 Cresson, No. 2 Foster and No. 1 Brown should be completed within 15 days as they only have a few hundred feet to go. The Shell is running 65 strings of tools in California, 42 at Long Beach, 12 at Ventura Avenue, 3 at Brea Olinda, 2 at Mount Poso and 1 at Round Mountain, the remainder in wildcat territory. The Pan American listed two deep-zone completions, both recompletions after being redrilled and deepened from the upper to the lower horizon. No. 2 Chainey registered an initial of 1,210 bbls. of clean 29.8 gravity oil daily from 6,157 feet, while No. 2 McKeon came in under a natural flow and tanked 530 bbls during the initial 24-hour test from 6,450 feet. The Pan American has several other immediate potential producers under way and three or four should be tanking oil within 15 days.

Dabney & Johnston, who have already finished several large producers in the lower zone, completed No. 3 Leonard and boosted their daily production 815 bbls., this well having been finished at 6,452 feet. The Continental Oil Co., which has experienced considerable success in the Richfield district, put No. 1 Modoc at Long Beach on a preliminary production test after it threatened to blow out several times and it looks good for approximately 1,200 bbls. per day from the 6,734-foot level. The importance of this well is that it proves up the western end of the field for substantial production. The Chiksan Oil Co. completed No. 1 Parker a few days ago and this well, originally started by the Exchange Petroleum Co., came in under a natural flow doing 2,540 bbls. of 30.7 gravity oil and approximately 2,400,000 feet of saturated gas daily from a depth of 6,524 feet, the hole having been finished with a 5¾-inch oil string carrying 1,350-feet of perforated.

Redrilling Disappoints

The Cypress Oil Co. has just recompleted No. 3 Crest after redrilling and deepening it to the 6,100-foot level, but the initial production, 1,430 bbls., does not compensate for the additional work undertaken. This well was brought in a few weeks ago flowing 1,200 bbls. per day from 5,820 feet but it was killed and drilling resumed to take advantage of the additional penetration of oil sand available. Under ordinary conditions this well would have been good for about 2,500 bbls. daily and consequently the small initial flow chalked up upon recompletion this week is due to an abnormal condi-

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tion. The company succeeded in redrilling and deepening from 5,820 to 6,100 feet but the hopes for substantial production wilted when a twistoff left several hundred feet of drill pipe in the hole. The crew was unable to recover this fish and the lower part of the hole is probably sealed off. The Bolsa Chica Oil Co. is down 4,775 feet in No. 5 Mutual and rig construction for No. 6 is under way. No. 4 Mutual, finished by the Bolcha Chica during February, is doing a little better than 2,100 bbls. per day compared with an initial of 2,495 bbls. daily. The Crown City Oil Co. put No. 2 Graham on a production test several days ago and this new well came in under a natural flow doing 378 bbls. daily from 6,400 feet, the hole being finished with a 6¼-inch carrying 1,030 feet of perforated. The Keck Syndicate finished a rather small well when No. 3 Kading on Lease 5 was given a production test from 5,615 feet, the initial output being 580 bbls daily. It was killed and drilling resumed due to the small initial output.

Ventura Avenue

It looked for a time as though the Richfield Oil Co.'s No. 6 Denni, a 7,401-foot hole, might bring California's deep-zone production record to the Long Beach Field but the Associated Oil Co. stepped out and drilled a 7,528-foot hole at Ventura Avenue and this project, No. 100 Lloyd, will be given a production test. If commercial production is secured it will be the largest deep-zone producer on record. The Associated has three other wells nearing completion in the Ventura Avenue Field and the entire trio, No. 24 Lloyd, No. 11 Hartman and No. 4 Ventura Land & Water, should be tanking oil within a few weeks. The M. K. & T. Oil Co. is making preparations to test out No. 1 Foster, in the southern part of the field, at 4,930 feet. The wells of the Petroleum Securities, to the north and nearer the apex of the structure, failed to show anything unusual. The M. K. & T interests carried No. 1 Foster down to 4,993 feet but plugged off the bottom 63 feet because of a suspicious gray sand which might have been water bearing. It is not likely No. 1 Foster will result in substantial production because of the limited amount of sand but deeper drilling may result in commercial production. The Shell will probably complete four wells in the Ventura Avenue Field within 30 days and these, together with a similar number expected to be finished by the Petroleum Securities, should cause a slight temporary upswing in the production curve of this field.

Rincon

The Pan American's test of the 3,954-foot level in the Rincon Field was a distinct disappointment as the well, No. 2 State, showed an initial pumping of only 125 bbls. daily. The company's No. 6 Hobson started off flowing 950 bbls. daily from the shallow zone at 3,170 feet but it is not likely this high yield will continue for more than a few days as there is not a sufficient thickness of oil sand. The Miley Oil Co. is drilling ahead in No. 1 Hobson as a result of the failure of this well, like No. 2 State of the Pan American, to develop commercial production around the 4,000-foot level and this horizon will be passed up in search of something more productive. The Chanslor-Canfield Midway Oil Co. re-entered No. 1-B Hobson, which blew in flowing at the rate of 750 bbls. per day when shot a few weeks ago only to subsequently sand up, and a determined effort will be made to finish this well as a commercial producer as this will automatically prove several hundred acres as it is located about a mile southeast of the intensely drilled area now under active development along the ocean front. The General Petroleum is building two new rigs on the Hobson lease and may spud in No. 4 Tomson, a new well, soon although actual spud may be held up pending the completion of No. 2 Tomson, which got under way late last week. The Standard Oil Co., developing the Southern Pacific Railroad Co.'s right of way, is running four strings of tools at Rincon, three of these wells being down approximately 3,000 feet.

Midway-Sunset

The Republic Petroleum's No. 25 in Section 8-32-23 has just closed its test week of production and the current output, 1,140 bbls. from 2,704 feet, is holding up exceptionally well. The Republic is disposing of this crude to the Standard Oil Co., the current market price for 22-gravity oil being 83 cents per barrel. The Standard is also taking the natural gas production from No. 25 and after extracting the natural gas gasoline is returning the dry gas to the Republic for boiler fuel. The Republic spudded in No. 31 in Section 7-32-23 a short time after the completion of No. 25 in Section 8-32-23 and this project should be in a position to make a bid for production before the close of May. The Chanslor-Canfield Midway Oil Co. is stepping right along with No. 29 in Section 8-32-23, an offset to the Republic Petroleum's No. 25, and this well may be tanking oil within three weeks as it is showing oil and gas at 2,255 feet. The Chanslor-Canfield's No 4 in Section 7-32-23 recently passed the 1,000-foot level and should come into production late in May or early in June.

The Republic Petroleum and Chanslor-Canfield Midway Oil Co. have entered into a gentlemen's agreement to prevent any unnecessary offsetting and this commendable policy precludes any intensive development regardless of the productivity of this deep zone as both companies will observe a 200-foot setback from property lines. The Signal Gasoline Co. redrilled and deepened its No. 1 in Section 8-11-23 to 3,147 feet and returned it to production doing approximately 75 bbls. daily, the output showing a rather high cut. The Midway Northern Oil Co. has purchased the holdings of the Yellowstone Oil Co. in Section 7-11-23 and preparations are being made to spud in a new well. The Belridge Oil Co. brought in a 170-bbl. producer in the eastern part of the Belridge Field when No. 118 in Section 31-28-21 was put on production after being redrilled and deepened from 840 feet to 2,850 feet. The Belridge Field has been under development for a number of years and the initial production of new wells is as a rule exceptionally small, although favorable production is chalked up from time to time. The oil ranges from 14.0 to 35.0 gravity, depending upon the completion depths, the quality improving with depth.

Northern California Wildcats

Three new wildcats are scheduled in the San Joaquin Valley within two or three weeks. The Pacific Eastern is starting a new well in the Union Avenue area of Kern County, a few miles south of Bakersfield, which should go a long way toward proving or disproving commercial production in this area. The Pacific Eastern's initial wildcat showed unusual promise at one time but failed to result in commercial production presumably because of mechanical trouble as it staged a number of gas blowouts and shot an intermittent but solid stream of oil to the crown block on several occasions The company drilled a second test north of No. 1 and while this hole is still being worked on the outlook is not too promising, especially as it did not register the kick showed by the first test. The third hole to be drilled will be one or two locations south of No. 1 and it is believed the potential field is south of previous work. The Pacific Eastern spudded in two new wells in the Fruitvale Field, 4 miles northwest of Union Avenue, which it opened several months ago, and both wells should come into production within 60 days.

The General Petroleum has started active preparations to test its holdings at McFarland, approximately 20 miles north and west of Bakersfield and about 5 miles south of Delano. The General Petroleum has several thousand acres under lease and the first wildcat will be on the Stiles property. The Texas Corporation has a location staked for a new wildcat test to be drilled in the Arvin district, south and east of the West Patch area in southern Kern County which will be drilled on property sur-

leased from the Marland Oil Co. and will be the first conclusive test although a number of holes have been drilled in the surrounding area. The Shell recently started a new well on the Cowell property in the Halfmoon Bay district in the northern part of the State and although No. 1 has been listed for abandonment at 5,906 feet sufficient indications were noted to warrant expectation of production in No. 2, which will be in close proximity to No. 1 Butts, at present held up with mechanical trouble at 1,655 feet.

The Milham Exploration Co. is hung up with a difficult fishing job in its Kettleman Hills wildcat at 7,236 feet. The industry is interested in determining the value of the deep oil sand in this area. The Milham actually tapped an oil sand but its value and thickness is merely conjectural. The Petroleum Securities expects to test out its No. 1 Diablo in Ventura County early in the week.

Southern California Wildcats

George F. Getty has suspended drilling operations on his Seal Beach wildcat in Orange County at 5,530 feet but there is a probability some additional hole will be added before this test is definitely abandoned The Olympic Refining Co. may also undertake some additional work on its recently abandoned wildcat at Sunset Beach. McCollom & Taylor, local representatives of the Prairie company, are rotating ahead in their Westminster wildcat at 1,711 feet and while good footage has been chalked up nothing of special importance is anticipated before the 4,500-foot level. The White Behr Oil Co. has just passed the 5,300-foot level in No. 1 Watson, a wildcat in the Watson tank farm area south of the Dominguez Field in Los Angeles County. The outlook is not any too encouraging.

GULF COAST FIELDS

(Continued from Page 59)

virtually steady, the decrease being slight. Daily average production by fields was:

Spindletop	38,265
Saratoga	1,228
Batson	1,417
Goose Creek	7,245
Sour Lake	3,456
Hull	10,586
Big Creek	1,465
Dewalt	250
West Columbia	8,480
Humble	3,379
Pierce Junction	11,329
Blue Ridge	8,913
Markham	225
Orange	4,657
Damon Mound	915
Dayton	237
South Liberty	3,412
High Island	238
Moores Field (Orchard)	44
Boling	2,501
Nash Dome	2,000
Barbers Hill	600
Allen Dome	325
Vinton	4,540
Starks	182
Edgerly	1,113
Evangeline	1,169
Lockport	3,828
Sweet Lake	....
Sulphur	2,601
Hackberry	3,225
*Borrowing	....
Bayou Boullion	200
Anse La Butte	55
Miscellaneous	230
Total this week	128,310
Total last week	125,421
Increase	2,889

*Production shut in.

Southwest Texas

Somerset	2,166
Lytton Springs	1,412
Dale	1,110
Luling	13,920
Miscellaneous	7,955
Total this week	26,563
Total last week	26,606
Decrease	43

East Central Texas

Mexia	7,286
Cedar Creek	600
Nigger Creek	700
Currie	487
Wortham	1,875
Richland	532
Powell	11,578
Total this week	23,058
Total last week	23,237
Decrease	179

South Liberty—Liberty County

Abercrombie & Harrison's No. 1 Lacour has been put on the pump making 45 bbls. daily. This well originally completed the latter part of March flowing 125 bbls. from sand at 2,814 feet, was deepened to 2,861 feet in cap rock but was plugged back to the sand at 2,818-33 feet. Two more South Liberty tests have been abandoned in cap rock, these being Sun Oil Co.'s No. 1 Richardson and R. L. Young and associates' No. 1 Wood, both approximately 1,000 feet southeast of the discovery well. These found the cap shallow, the former at a total depth of 1,326 feet and the latter at 1,250 feet.

Sun Oil Co. has drilled plug in its No. 1 Singleton at 1,846 feet and is bailing for a test. The Texas Company's No. 1 Pickett is drilling sticky shale at 3,157 feet. This company's No. 4 Green is in gumbo at 1,018 feet.

All the above wells and tests are in the mile north extension district. In the extension just north of the main part of the field, two wells were being bailed, Sun Oil Co.'s No. 3 Mitchell and Yount Lee Oil Co.'s No. 4 Mitchell. The former is in a sand at a total depth of 3,282 feet, the sand being at 3,224-34 feet. The No. 4 Mitchell is testing a sand at 3,560-74 feet after being plugged back from heaving shale at a total depth of 4,364 feet. Yount Lee Oil Co.'s No. 5 Mitchell still is only a derrick. The Texas Company's No. 9 Staiti is drilling shale and lime at 3,254 feet, while No. 10 Staiti is in shale and lime at 2,250 feet.

Blue Ridge—Fort Bend County

Blue Ridge got two small wells, Sinclair Oil & Gas Co.'s No. 1 Davidson and Sam Watts and associates' No. 3 Blakely. The former is making 500 bbls. from sand at 3,553 feet while the latter is flowing 300 bbls. from sand at 3,678 feet.

Navarro Oil Co. got a gas well in its No. 4-B Robinson but is to deepen this test from the present sand at 3,824 feet. In addition to the location for No. 5-A Robinson recently made, Navarro has locations for No. 5-B Robinson and No. 6-A Robinson. Watts Brothers also have two other tests, No. 4 Blakely on which drilling was started during the week and No. 2 Scott, which is being rigged up. Bowden Oil Co.s No. 2 Overly is drilling below 2,200 feet. Gulf Production Co.'s No. 13 Luscher is drilling at 1,274 feet, and No. 11 Brakely at 3,810 feet. H. R. Cullen has derricks up for two more tests, No. 1 A. J. Lee and No. 3 Blakely. No. 2 Davidson is drilling at 3,800 feet and No. 1 Luscher at 5,114 feet. No. 2 Blakely started drilling early in the week and is down 1,205 feet.

Big Creek—Fort Bend County

Gulf Production Co. is cutting liner to deepen No. 25 Davis. No. 46 Davis is drilling at 2,003 feet. Navarro Oil Co. is starting drilling in No. 1 Davis.

Nash Dome—Fort Bend County

Rycade Oil Corp. went into salt and abandoned its No. 25 Wisdom at a total depth of 4,304 feet. Its No. 24 Wisdom has screen set for a test at a total depth of 4,267 feet as the week closed. Rycade corporation is resetting screen in its No. 2 Flessner, an old well, and is preparing to deepen its Nos. 12 and 14 Wisdom.

Hardin County Domes

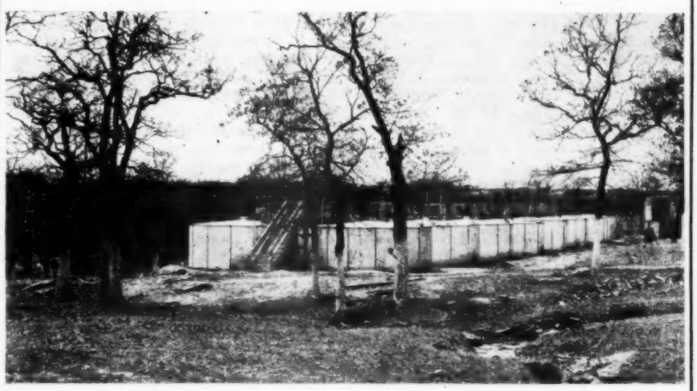
Hill & Dowell have completed their No. 96 Milhome in sand at 1,298 feet pumping 40 bbls. of fluid, of which half is water. East Batson Oil Co.'s No. 6 Conzelman is in a sand at 826 feet and is being bailed. Paraffine Oil Co.'s No. 72 Paraffine also is being bailed at 1,112 feet.

At Saratoga, Gulf Production Co. got a small pumper in its No. 26 B. B. B. & C. which is making 6 bbls. net of oil from sand at 1,482 feet. Paggi Brothers' No. 45 Queen City, is pumping 295 bbls. of fluid of which 95 per cent is water, and Rio Bravo Oil Co.'s No. 83 Jordit is pumping 150 bbls. of fluid, 40 per cent water, from sand at 1,155 feet.

At Sour Lake, Gulf Production Co. is rigging up to deepen its No. 2 H. A. Thompson and is drilling at 4,478 feet in its No. 1 Hamman. Lake View Oil Co.'s No. 33 Hardin is drilling at 1,513 feet.

Pierce Junction—Harris County

Of particular interest at Pierce Junction was Gulf Production Co.'s No. 1 Perry, which deepened less than 40 feet found a deeper sand and came in flowing 1,200 bbls. of oil. Total depth now



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is 5,449 feet. This well, on the east flank of the dome, was completed early in February flowing initially 500 bbls. of pipe line oil from sand at 5,429 feet. Another well showing good is Moody Corp.'s No. 1 Armstrong on the northwest flank. This well is being bailed from a deep sand at 5,578 feet. Moody Corp.'s No. 1 Settegast also is bailing. Abercrombie & Harrison's No. 1 Ritter is drilling at 3,735 feet. Anderson & Plummer have a rig up for No. 3 Whitehead and starting drilling. H. R. Cullen is drilling at 3,065 feet in No. 5 Howe. His No. 1 Brock, about 4 miles south of Pierce Junction, and a half mile south of Almeda, was abandoned at 3,524 feet. Gulf Production Co. is sidetracking at 4,465 feet in No. 19 Taylor and is drilling at 4,726 feet in No. 25 Taylor. Leonard Petroleum Co.'s deep test, 500 feet southwest of production, is drilling at 5,755 feet. This is in a sidetracked hole, the original total depth being 5,940 feet. Moody Corp.'s No. 2-A Whitehead is drilling at 3 825 feet and No. 1 Boyle & Mincken at 4,300 feet. Navarro Oil Co.'s No. 10 Dooley is down 4,234 feet. Rio Bravo Oil Co.'s No. 5-A Settegast at 3,860 feet; Rio Bravo's No. 10-A Settegast at 1,705 feet; Smith and associates' No. 3 Parsons 1,225 feet, and Woodward & Lee's No. 1 Settegast at 3,282 feet.

Goose Creek—Harris County

Port City Oil Co.'s No. 2 Addey, an old well deepened to a sand at 2,094 feet, has been completed pumping 65 bbls. of oil daily. Gulf Production Co.'s No. 16-A Tabb is pumping 40 bbls. Humble Oil & Refining o.'s No. 73 Simms-Smith, 1½ miles east of the main part of the Goose Creek Field, and a deep test, Saturday was bailing mud and sand with a small showing of oil and gas. It is at a total depth of 6,159 feet. The latter company is rigging up to deepen No. 24 Gaillard (25 acres). Gulf Production Co. is milling at 1,608 feet in No. 10 Prather, an old well to be deepened.

Spindletop—Jefferson County

Yount Lee Oil Co. got a good well at Spindletop in its No. 14 fee which was completed Friday flowing 2,300 bbls. of 32.7 gravity pipe line oil through a half-inch choke. This was an old well deepened to a sand at a total depth of 3,792 feet. Three other wells have been brought in at Spindletop in the past 10 days, Yount Lee's No. 54 Gladys City, flowing 1,000 bbls., 8 per cent water and sediment, from sand at 2,900 feet; the same company's No. 58 McFaddin, pumping 300 bbls. from 4,830 feet, and Gulf Production Co.'s No. 13 Oakwood, flowing 305 bbls. from 5,536 feet. No. 54 Gladys City originally was reported abandoned at 6,400 feet but was sidetracked and drilled to 2,900 feet. No. 58 McFaddin went to a total depth of 5,360 feet, but went back to the sand at 4,830 feet. Yount Lee Oil Co. has abandoned its No. 7 Gladys City after testing salt water at 2,900 feet, and Gulf Production Co.'s No. 1 Jeanette Mann also tested salt water at 4,224 feet and has been abandoned.

Gulf's No. 19 McLean is drilling at 5,368 feet. This company also has a rig up for No. 231 Gladys, a shallow test. Sun Oil Co.'s No. 1 McLean is drilling at 5,515 feet. On the northeast flank, Battleship Oil Co.'s No. 1 Keith is drilling at 1,610 feet. Sun Oil Co.'s No. 1 Prather on the east is down 4,465 feet. Traders Oil Corp.'s No. 1 Cissell, north of Spindletop, is drilling near 4,700 feet, while The Texas Company's No. 1 Gladys City, a wildcat northwest of production, is drilling below 4,470 feet.

Yount Lee Oil Co. is setting 7-inch casing at 6,207 feet in its No. 1 Quinn and if completed successfully it will be the longest single string of casing on the Gulf Coast.

Hull—Liberty County

Republic Production Co. completed two wells at Hull. No. 56 Dolbear, an old well deepened, is flowing by air 4,000 bbls. of fluid, of which 400 bbls. is oil, from sand at 2,778 feet, while No. 77 Dolbear, another old well, has been put on the pump for 200 bbls. of fluid. 35 per cent water. Gulf Production Co.'s No. 20 Phoenix is blowing dry gas from sand at 3,046 feet. The latter company's No. 91 has started drilling and is at 1,480 feet. Republic Production Co. is rigging up to deepen No. 70 Dolbear and already is drilling deeper in No. 104 Dolbear. Houston Production Co.'s No. 4 Taylor is drilling at 4,782 feet. The Texas Company's No. 1 Carr is drilling at 980 feet, while The Texas Company's joint well with the Vacuum Oil Co., No. 6 Hannah, is milling out at 3,155 feet to deepen.

Orange—Orange County

Gulf Production Co. is putting its No. 8 Chessom on the pump after deepening it to another sand at 4,148 feet. This company's No. 12 Pevoto is drilling at 3,395 feet. Orange Petroleum Co.'s No. 6 Winfree, another old well deepened, also is to be put on the pump, in a sand at 3,179 feet. Rycade Oil Corp. is rigging up to deepen its No. 6-A State. Supreme Oil Co.'s No. 2 Jackson is drilling at 4,274 feet. Tillery Oil Co.'s No. 3 Tasco is standing.

High Island—Galveston County

Gulf Production Co. has moved the rig of No. 2-A Smith, completed two weeks ago, back to No. 2 Smith, which had been abandoned temporarily and is getting ready to deepen it. It was abandoned at 4,838 feet although the original hole was drilled to 4,918 feet. Gulf's No. 1 League is drilling at 2,565 feet. McLean Oil Co. is resetting strainer in No. 6 Cade and is drilling at 2,945 feet in No. 13 Cade.

Damon Mound—Brazoria County

Leonard Petroleum Co. has taken over the Brazos Oil Co.'s No. 3 Wisdom in the A. Darst Survey, Block 51, and will set up a big rig. This test was down at 1,560 feet. The only other drilling test in the field is Sinclair Oil & Gas Co.'s No. 3 Norton.

Moores Field—Fort Bend County

Gulf Production Co.'s No. 15 Moore is drilling at 4,265 feet. This is the only test in the field (Orchard) which is controlled by the Gulf Production Co.

West Columbia—Brazoria County

Following the completion of No. 1 Tom Hogg, an old well deepened to 2,917 feet, Gulf Production Co. is rigging up to deepen No. 3 Tom Hogg. No. 1 was put on the pump for 150 bbls., of which 1.5 per cent was water. McNellie Oil Co. has spudded in its No. 1 Bartlett.

Barbers Hill—Chambers County

Mt. Bellview Oil Co. has abandoned its No. 1 Williams, drilling into shale at 4,550 feet. Humphreys Oil Corp.'s No. 1-A Barber drilled into cap rock at 1,149 feet but this test is to be deepened as operators are of opinion this might be a false cap. Bennett Petroleum Co. and Moody Corp.'s No. 9 fee (Barrow) reset screen and was brought back flowing 400 bbls. of pipe line oil from the sand at 3,198 feet.

Markham—Matagorda County

A location for another test at Markham, No. 1 Hawk, was staked during the week by West Production Co. and a derrick is being built. This is in the W. H. Gaynor Survey No. 550, 200 feet from the south line and 100 feet from the east line of the tract.

SOUTH LOUISIANA

Jennings—Acadia Parish

E. L. Simms' No. 1 Cockrell, Section 45-9s-2w, drilled into cap rock at 2,918 feet. E. L. Meyers' No. 1 Arnandet is in a sand at 1,896 feet and is being bailed. Cline, Smith & Cline have started drilling No. 3 Lucy Wilson and are down 1,200 feet. Port City Oil Co.'s No. 9 Syndicate fee, is drilling around 1,150 feet, and Salt Dome Oil Co.'s No. 2 Valle Arpent at 1,100 feet. The Texas Company's No. 3 Rayne is drilling at 4,235 feet. Yount Lee Oil Co. is starting a new test, No. 97 Crowley, having spudded in the past week. This is in Section 48-9s-2w.

Edgerly—Calcasieu Parish

Green Oil Co. has abandoned its No. 1 Read as dry at 3,998 feet. W. T. Burton has a rig up for No. 1 Koonce. C. M. Crotty's No. 13 Lillard is drilling at 2,174 feet. Gilmer Oil Co.'s No. 1 Fairchilds still is fishing. Hercules Oil Co.'s No. 4 Paraffine is drilling at 3,048 feet. Rex Petroleum Co.'s No. 4 Hunter at 4,075 feet and Wilson-Broach's No. 2 Wilson at 3,785 feet.

Lockport—Calcasieu Parish

Vacuum Oil Co. and Gulf Refining Co. got a salt water well in their No. 1 Calcasieu River which tested a sand at a total depth of 3,561 feet Friday and now are pulling liner to deepen. No. 5 Lock-Moore is drilling hard sand rock at 4,102 feet and No. 1 Bayou D'Inde is in gumbo at 4,230 feet. A derrick is being built for No. 2-A fee and also one for No. 1-B fee. No. 3 Frieber & Wolf is breaking down drill stem. No. 3 Miller is fishing. No. 20 Miller, waiting derrick material. No. 3 Farquahar is breaking down drill stem while No. 4-A Farquahar is preparing to drill deeper. It is at a total depth of 1,211 feet.

Vinton—Calcasieu Parish

Gulf Refining Co.'s No. 45 Star-Vincent is pumping 100 bbls. of oil from sand at 3,046 feet. Vinton Petroleum Co. has a rig up and is spudding in No. 16 Harmony.

Starks—Calcasieu Parish

Gulf Refining Co. has abandoned its No. 10 Industrial at 4,667 feet but has started a new test, No. 9 Lutcher-Moore, the latter being on the north flank.

CANADIAN FIELDS

(Continued from Page 62)

Corp.'s No. 1, LSD 4, Section 5-20-2w5, is making good progress salvaging the casing from its deep test, abandoned at 6,600 feet. Some 6 000 feet of 6-inch casing and 4,500 feet of 8¼-inch have been taken out, and the drillers are working on the 10-inch string. As soon as the casing is salvaged, work will be started on No. 2 test, in LSD 6, Section 12-20-3w5, fairly close to the new Royalite No. 8 deep producer.

McLeod Oil Co. held its annual meeting at Calgary recently when the following officers were re-elected: R. J. Hutchings, president; W. E. McLeod, vice president; George H. Cloakey and E. H. McLeod, joint managing directors; J. G. Edgar, secretary-treasurer; and C. S. Smith, John I. McFarland and George Cloakey, Sr., directors. Reports showed that McLeod's No. 1 had been deepened to the Madison limestone and on a production test made 149.41 bbls. in 24 hours. No. 1 has been blowing off intermittently under 1,000 pounds pressure, and is gradually increasing its production. No. 4 is at 2 017 feet and running 12½-inch casing. No. 3 is drilling around 3,100 feet. The position of the company has been materially improved by the bringing in this year of No. 1 well with a good production in the deep lime. Nos. 3 and 4 are expected to reach the same producing horizon this season. The wells are grouped in LSD 16, Section 1-20-3w5.

Calmont Oils, LSD 2, Section 1-20-3w5, is reported drilling at 5,466 feet, 4 feet in the deep lime. It will drill about 10 feet more, when the 6¼-inch will be set and cemented, and drilled in. The Calmont is 462 feet deeper than Vulcan's No. 1, the deepest producer in the field; now the deepest well drilling. The location is about a half mile due south of the McLeod producers. In the Fernie shale horizon about 150 feet above the present drilling depth an oil sand was encountered, apparently corresponding to the sand encountered in the Home and Dalhousie No. 5 wells, where about 7 bbls. of light gravity crude were bailed in an hour. This is the farthest north point at which the Home sand has been met. The Calmont well should get deep-lime production around 5,600 feet or less.

Making 40 Bbls.

Spooner Oils No. 1, LSD 12, Section 13-20 3w5, is producing at 4.978 feet and making 40 bbls. a day of crude naphtha. Spooner No. 2, Section 24-20-3w5, is rigging up. Seneca Oils, LSD 1, Section 34-20-3w5, is drilling at 4,200 feet with 8¼ casing to the bottom of the hole, and bringing up a little oil with the bailings.

In the north end of the field Stockmen Oils No. 2, formerly Henderson Oil No. 1, LSD 7, Section 27-20-3w5, has finished setting stove-pipe casing at 150 feet. The location is a quarter mile north and slightly west of No. 1, finished as a gasser at 1,760 feet. No. 2 is being drilled on gas from No. 1.

Regent Oil Co., LSD 16, Section 1-20-3w5, is running three shifts and drilling at 2,200 feet with 12½-inch casing almost to the bottom of the hole.

East Crest Oil Co., LSD 5-6, Section 16-19-2w5, in the far south end of the field, is working on a 114-foot derrick and is expected to spud in before the end of May.

Turner Valley Production

The latest production figures for the Turner Valley Field are as follows:

Crude Naphtha Producers

	Bbls.
*Royalite Nos. 1 and 2	8
McLeod Oil Co. No. 2	40
Spooner Oils No. 1	40
*Royalite No. 7	40
Illinois-Alberta No. 1	55
Vulcan Oils No. 1	95
McLeod No. 1	100
*Dalhousie No. 1	150
*Royalite No. 4	240
*Royalite No. 8	603
Total	250
	1601

Light Crude Oil

Canada Southern	15
*Home Oil Co. No. 1	24
*Royalite No. 10	18
New McDougall-Segur No. 1	33
New McDougall-Segur No. 2	33
*Dalhousie No. 5	56
*Foothills No. 2	60
Total	239

Wells marked with an asterisk are Imperial Oil, Ltd., subsidiaries, and the figures show that of the crude naphtha production, 1,180 bbls. a day comes from the Imperial group and 425 bbls. from other companies; while of the light crude oil, 167 bbls. is produced by the Imperial group and 72 bbls. by other interests.

In the Highwood district, Imperial Oil, Ltd. Highwood No. 1, LSD 3, Section 36-18-3w5, is at 3,624 feet and in the top of the Fernie shales. This test will be finished with the diamond drill outfit from Royalite No. 6 in the Turner Valley, which should get production within two weeks.

Moose Mountain

In the Moose Mountain district, Signal Hill Oil Co. No. 2, LSD 9, Section 34-23-5w5, is at 1975 feet and underreaming to carry on casing. Macabee Creek Oils, Ltd. of Calgary has secured acreage from the Alberta Foothills Holding Co. and is moving derrick timbers. The site is about 2 miles north of the old British American diamond drill test, started in the Calgary boom and abandoned unfinished at 1,000 feet.

In De Winton district, Anglesey-Lakeview No. 1, LSD 1, Section 22-21-1w5, is resuming drilling after setting 8¼-inch casing at 2,713 feet.

In the Buffalo Lake district, Cardinal Oils, Ltd. which has a derrick up in LSD 1, Section 28-40-19w5, will likely start drilling next month.

In the Wainwright Field, Wainwell Oils, Ltd. of Toronto has taken over the unfinished test of the Interior Oil Co. in Section 36-44-7w4 and is to resume drilling, at 2,100 feet, which should be close to production. Fabyan Petroleums, Ltd., LSD 8, Section 24 45-8w4, are resuming at 1,100 feet. British-Wainwright Oils, No. 1, LSD 4, Section 31-45-6w4, shut down at 2,222 feet with the casing cemented on top of the sand, will probably be drilled in this month. The Sasko-Wainwright Oil & Gas Co., which has a location in LSD 1, Section 19-45-6w4, is unloading machinery.

British Petroleums, Ltd., the pioneer company in the Wainwright Field, has made a deal with Vancouver, B. C. interests to further test its acreage. The new organization has been incorporated under the name of Hargal Oils, Ltd. Under the agreement with British Petroleums, Ltd., that company turns over 40 acres in the Turner Valley Field, 10,000 acres to be selected by the new company from its Wainwright holdings, and all drillings and office equipment. British Petroleums shareholders have the privilege of exchanging for shares of Hargal Oils, Ltd. on the basis of 10 British Petroleum shares and 10 cents for one share of Hargal. This right expires on July 31. British Petroleums, Ltd.,

also is allotted 50,000 shares of Hargal stock.

Norwegians to Drill

In Northern Alberta, P. Weymarn of Oslo, Norway, representing Norwegian capital, will drill a test in the Athabaska district, in Township 89, Range 3w4, below Cascade Rapids and 40 miles east of Waterways. Work will be started early this month. A standard outfit secured at Ponoka, Alberta, will be used by A. M. Slack, head driller. The drilling will start in the Devonian limestone with a 12-inch hole and the oil sand is looked for between 800 and 1,000 feet. The location is near a fault line, and a zone of fissures is indicated by sulphur springs.

In the Skiff Field, southern Alberta, Imperial-Devenish No. 2, N half Section 11-5-14w4 is unloading camp and drilling equipment.

In the Warner district, Gas Production & Transportation, Ltd., NE Section 21-4-18w4, which recently successfully shut off water at 2,930 feet has had trouble with caving. The well has been cleaned out and drilling resumed.

In the Chin district, Lethalta Oils, Ltd. will spud in about May 15. On the Beaver Dome Madison Oils, Ltd. of Calgary has a tentative location in Section 24-2-11w4.

In the Pincher Creek district, Alberta Gas & Fuel Co. Doherty No. 1 Section 24-2-29w4, near Hillspring, is drilling below 2,000 feet. It is expected Mount Royal Oil & Gas Co. No. 1, LSD 4. Section 7-6-1w5, shut down at 1,000 feet, will resume this month. Reports are current that the Henry L. Doherty interests, drilling the Doherty No. 1 near Hillspring, are arranging to take over the Mount Royal acreage on the Mill Creek structure and complete Mount Royal No. 1. These reports lack official confirmation.

Near Medicine Hat

In the Suffield district near Medicine Hat, Ontario Alberta Development Co., of Toronto test in Township 17-8w4 is expected to spud in May 10.

On the Moose Dome, in the foothills west of Calgary, Moose Oils, Ltd. has undertaken to spud in before June 1. Some 6,000 acres were held by R. W. Pilling and associates. It is claimed there are prospects of production in the Lower Devonian between 2,000 and 3,000 feet.

On the Montana side, Joseph Caswell and Jorn R. Gluck of Vancouver, British Columbia, are moving a rig to the Ryan permit, near Kevin, for No. 1 test of the Coast Loggers Oil Syndicate. The location is E half SE Section 4-34-3w. They plan to drill several tests. Commonwealth Petroleum, Ltd. of Calgary has abandoned its No. 1 Benjamin on the Devon structure in C SW NW Section 22-31-2e. A show of oil was met at the contact, but shortly after a string of tools was lost, and water troubles developed, preventing a test. No. 2 will be started immediately.

In the Sweetgrass Hills area just south of the international boundary the Sunburst Oil & Refining Co. is making a production test of its well in the Flat Coulee district. Oil was met in the Baskoo sand at 2,606 feet, and an additional show of oil with considerable gas in a 27-foot sand in the Ellis at 2,878 feet.

Rockland Oils, Ltd. of Calgary and a number of Calgary oil men are interested in the Etheridge-Steele No. 2 well in SE NE Section 12-34-1w in the Kevin-Sunburst Field, which got a big production at 1,357 feet. The well is reported a 2,500-bbl. gusher. Location was made by John Etheridge of Calgary, and is about 17 miles north and east of Shelby; it lies between two dusters.

In British Columbia, the British Columbia Oil Development Co. No. 2 test in the Sage Creek district is drilling at 600 feet. A small show of high-grade crude was met at 500 feet. Commercial production is expected around 3,100 feet.

SOUTHWEST WILDCATS

(Continued from Page 54)

and 150 feet to south line, is moving on. M. I. Shaw and others' No. 1 Jones, Survey 381, Block 12, located 171 feet to south line and 486 feet to west line, is drilling at 2,420 feet. L. M Holden and others' No. 3 Jones, Share 27, Block 136, is drilling at 2,566 feet.

Starr County

The Texas Company's No. 1 M. Guerra, Porcion 68, Block 91, located 1,000 feet to east line and 150 feet to south line, is drilling at 2,918 feet. J. V. McAleese and others' No. 1 Hicks & Hicks, Perdernal grant, 150 feet to northeast and southeast lines, is standing at 320 feet to move on rotary. Kusch Exploration Co.'s No. 1 Frank Doyno, Porcion 75, Block 13, is drilling at 800 feet.

Zapata County

Hill, Reiser & Weed's No. 1 H. Rodriguez, Block 1, R. V. Hill Subdivision, Villa grant, 870 feet to northwest lines and 450 feet to northeast lines, sand at 1,012-15 and 1,038-41 feet, and is now fishing at 1,041 feet.

Atascosa County

F. H Eckert and associates' No. 1 Blake, Survey 185, located 2,450 feet to northwest lines and 150 feet to southwest lines, has set surface casing at 86 feet in blue clay and is drilling at 460 feet.

Bastrop County

J. F. Miller Drilling Co.'s No. 1 Ed Jones, 2 miles northeast of Cedar Creek, is drilling at 150 feet. Rundus & Landua's No. 1 Frank Rundus, Bartens Creek and Smithville-Cistern road, has set 40 feet of 10-inch surface casing.

Bexar County

Allen Burnam's No 1 Ward, southwest of Martinez, is drilling at 1,100 feet. C. J. LeCompte's No. 2 Diaz, Survey 32, Block 4,283, located 450 feet south of No. 1, is standing at 72 feet on rock. F. H. Meyer's No. 1 B. Biering, Survey 416, located 450 feet to south and east lines, is shut down at 140 feet.

Bee County

Hurador Oil Co.'s (formerly D. Hewitt) No. 1 R. A. Ray, northeast of Pettus, total depth 2,675 feet, had gas showing at 2,480 feet that burned 15 feet high. Red Ant Oil & Gas Co.'s No. 1 Perry & Chesnut, B. Q. Hadley Survey, 450 feet to east line and 1,600 feet to south line, is standing at 1,375 feet.

Blanco County

C. W. Bates' No. 1 Herman Massey, Henry Manton Survey, 920 feet to north line and 660 feet to east line, is fishing at 214 feet for tools. Robert Rodson's No. 1 Glasscock, Survey 50, located 150 feet to CEL, has resumed drilling at 435 feet with cable tools.

Caldwell County

R. M. Bruner and W. H Ballard's No. 1 Davis, 4 miles northeast of Joe Bruner's No. 1 Davis in the Bruner Field, has derrick up. H. C. Ratcliff's No. 1 Brisco, James Hindes Survey, center, spudded in and shut down. Sutton & Carter's No. 3 Carter, few miles north of No. 1 Davis, has derrick material ordered out. Louis P. Schawe's No. 1 Ted Schawe, Thomas Maxwell Survey ,6,111 feet to southeast lines and 6,986 feet to northeast lines, topped chalk at 769 feet showing considerable gas.

Comal County

George Kruger's No. 1 Witmore Decker, A. Gayetan Survey No. 194, is location in the southeast corner.

DeWitt County

Durbin Oil Co.'s No. 1 Gohmert, G. W. Brooks League, 175 feet to north line and 300 feet to east line, is standing at 3,013 feet. Empire Southern Oil Co.'s No. 2 Smith, Survey 3, is standing at 3,150 feet. H. T. Roe's No. 1 Lienhard, D. J. Bibb Survey, is standing at 950 feet.

Dimmitt County

Humble Oil & Refining Co.'s No. 2 City National Bank, Survey 25, L.I.M. &C. Survey, 150 feet to north line and 860 feet to west line, at 1,448-51 feet, tested salt water and is now drilling deeper at 1,500 feet

Frio County

Karnes and others' No. 1 J. J. Little, B.S.&F. Survey No. 2, located 340 feet to east line and 300 feet south of Medina-Frio County line, is shut down at 607 feet. Blue Ribbon Oil & Gas Co.'s No. 1 Edwards, Hooper & Wade Survey, 920 feet to CNL, is coring at 2,350 feet in sand. P. A. Neilan's No. 2 Blackaller, James Gouley Survey, is standing at 2,960 feet.

Goliad County

C. W. Simpson's No. 1 Ideus, W. H. Pendleton Survey, 156 feet to north line and 540 feet to west line, is shut down at 2,323 feet.

Gonzales County

The Texas Company's No. 1 Denman, A. Zumwalt Survey, 100 feet to south and west lines, is drilling at 800 feet in blue shale. L. P. Unkel's No. 4 W. W. Johnson, C. H. Jaeger Survey, Section 2, east central part, is nearing pay formation at 601 feet thought in another well to be good for 10 bbls.

Guadalupe County

O. W. Killam's No. 1 Bailey, William R. King Survey, 150 feet to east line and 450 feet to north line, has been spudded in. J. M. Rentz' No. 1 Siligman & Freeman, Gustavus Chotwell Survey, 1,100 feet to southwest lines of farm and sursey and 1,130 feet to southeast lines of farm, is standing at 690 feet with no chalk yet. Wolf Creek Oil Co's No. 1 Mrs. L. Hocke, Harriet Cottle Survey, 150 feet to north and west lines of Mrs. L. Hocke's 54-acre tract, is location.

Hays County

Estess-Moore & King's No. 1 C. N. Sledge, Hunton & Jones Survey, 285 feet to northwest lines of farm, is drilling at 380 feet. J. E. Rodgers and others' No. 1 E. Hohenburg, 2½ miles east of San Marcos, is standing at 2,189 feet where it bailed a little oil.

Jackson County

J. B. Douglas' No. 1 C. O. Lowrance, 12 miles northwest of Edna, is drilling water well

Jim Wells County

Cushing Oil & Gas Co.'s No. 1 M. Perez, La Tinaja Survey, 600 feet to north and east lines of survey, is drilling at 1,350 feet in dark blue shale.

Karnes County

Reynosa Oil Corp.'s No. 2 Butler, Block 43, located 1,000 feet south of No. 1, is standing at 2,007 feet.

Kerr County

Walker-Van Duyn's No. 1 Bafield, B. B. Peck Survey, 4,700 feet to north line and 450 feet to east line, is shut down at 2,100 feet.

Live Oak County

War. Wood Hunt's No. 1 McNeil, Jane Curry Survey, 4,000 feet to NE cor. and 3,000 feet to northwest lines, is standing at 2,505 feet.

Medina County

California-Medina Oil Co.'s No. 1 Rohte, Survey 1,012, is shut down at 3,275 feet. Medina Oil Corp.'s No 1 Taylor, Survey 135, is shut down at 1,243 feet. Cecil Switzer's No. 1 Zerr, Survey 459, is shut down at 3,485 feet. Yantis, Carl and others' No. 1 Tom Neumann, J. Haldy Survey No. 41, located 860 feet to north line and 431 feet to west line of survey, is moving on.

Maverick County

Ryan Consolidated Petroleum Co.'s No. I Indio, center Survey 14, is drilling at 4,400 feet in lime. Rycade Oil Corp.'s No. 1 Chittim, Section 129, Block 7, is shut down at 4,295 feet; No. 2 Chittim, Section 158, Block 7, is drilling at 5,335 feet and showing both oil and gas.

McMullen County

Houston Gulf Gas Co.'s No. 6 Jacob is location.

San Patricio County

Harry Carter's No. 1 Mayfield has derrick up Houston Gulf Gas Co.'s No. 2 Waelder, Calixto Survey, east central part of the lease, is drilling at 2,800 feet. National Oil Co.'s No. 1 J. E. Sullivan, J. C. McMullen Survey, 500 feet to SW cor., is drilling at 2,542 feet in lime rock. George Pickett's No. 1 Whitworth, NW NW Section 60, is drilling at 3,000 feet; No. 1 Garrett is standing at 3,030 feet. John Sigmund's No. 10 Robinson is deepening from 1,900 feet.

Travis County

T. P. Garrett's No. 1 Paul Rowe, R. Hornsby Survey, 900 feet to north and east lines, is standing at 1,025 feet. W. J Hill's No. 3 fee is shut down at 400 feet.

Uvalde County

Pure Oil Co.'s No. 1 J. D. Smythe, Survey 687, located 740 feet to north line and 146 feet to east of SE cor. of Survey 20, is drilling at 2,378 feet.

Val Verde County

Valvert Oil Corp.'s No. 1 Basset, C NE Section 47, Block Y, is moving on. East Del Rio Oil Co.'s No. 1 Russell. Section 183, is shut down at 3,325 feet. Independent Operators' No. 1 Whitehead, SE SE Section 30, Block 4, is shut down at 3,900 feet. O. O. Owens and others' No. 1 Mills, Section 128, is standing at 4,200 feet. W. V Traves' No. 1 Wilson. Section 115, is standing at 905 feet.

SOUTHWEST TEXAS FIELDS

(Continued from Page 54)

made initial production of 108 bbls. the first hour.

William F. Morgan, Inc.'s No. 2 W. N. Osteen, Dale Field, Swearingen Survey, at 1,871 feet total depth bailed very small well and was shot with dynamite and is still bailing and looks like a very small well.

Duval County

Houston Oil Co.'s No. 1 Woods-Welder, Survey 233, wildcat test, has been abandoned at 3,484 feet.

Partee and others' No. 1 Habl, Survey 78, Block 16, also wildcat test, has been abandoned at 2,402 feet where it tested salt water.

Bexar County

Larsen-Walsh's No. 1 Oppenheimer, Survey 180, has been abandoned dry at approximately 1,940 feet.

Jim Hogg County

Magnolia Petroleum Co.'s No. 37 Merchants State Bank in Survey 415 of the Randado Field, has been abandoned dry at 1,840 feet.

M. I. Shaw's No. 1 Jones, Survey 381, Block 12, wildcat test, has been abandoned at 2,504 feet dry.

Refugio County

Saxet Oil Co.'s No. A-6 Wilson Heard at 2,860 feet has been completed for 40,000,000 feet of gas with 1,100 pounds rock pressure and is new sand for the field.

Val Verde County

Magnolia Petroleum Co.'s No. 1 Whitehead, Section 81, Block D, G.C.&S.F. Survey, has been abandoned at 6,665 feet in black shale.

Webb County

Cole Petroleum Co.'s No. 56 Benavides, Survey 412, Cole Field, reported last week as large gasser is in error, for the well is making 200 bbls. of oil; No. 57 Benavides in the same survey and field is standing at 2,338 feet with 800 feet of oil in hole.

Magnolia Petroleum Co.'s No. 1 Garcia, Survey 53, Schott Field, has been junked at 4,192 feet and the test abandoned.

Zavala County

Tritex Oil Corp.'s No. 2 West, Survey 43, in the West gas field, has been completed at 850 feet a gasser of 3,000,000 to 4,000,000 feet.

Zapata County

Hill, Reiser & Weed's No. 1 H. Rodriguez, in Block 1, of the Charco Redondo Field, has been abandoned at 1,060 feet.

NEW LOCATIONS

Bexar County

Schimmel Production Corp.'s No. 4 Tick, Block 265, Somerset Field, is location 680 feet west of No. 2; No. 26 Koehler, Block 265, same field, is location 250 feet to north line and 150 feet to west line.

Caldwell County

Roxana Petroleum Corp.'s No. 1 Medford is location offsetting The Texas Company's No. 1 Medford in the new Lockhart Field.

The Texas Company's No. 3 F. M. Branyon, Richard Jarmon Survey, in the Lockhart Field, is location 150 feet east and north of No. 2; No. 1 W. O. Medford, Dillard Cooper Survey, in the same field, has derrick up, location 150 feet to south line and 150 feet west of creek across east line of tract.

Charles Carter and others' No. 1 Ike Heidenheimer, John R. Miller Survey in the Lockhart Field, has derrick up and

Adoption of General and Permanent Policy of Co-Operative Development of Oil Pools Urged by President of Mid-Continent Oil & Gas Association

A significant statement concerning what is believed to be an evolutionary development in the manner of conducting the oil producing business was made by Wm. N. Davis, President of the General Mid-Continent Oil & Gas Association, Saturday.

Mr. Davis' statement was made after carefully canvassing opinion among experienced oil producers and is believed to presage study and activity by the Mid-Continent Oil & Gas Association to crystallize sentiment and to assist the operators in formulating plans whereby voluntary co-operation in the development of oil pools will become the rule rather than the exception.

The Mid-Continent Oil & Gas Association invites comment on the Davis statement which is as follows:

"Conservation of the nation's petroleum resources and the economic troubles of the oil industry have been so constantly under discussion for several years that it would seem there could be little left unsaid, and should be little left undone, to correct the undesirable conditions; but, without detracting in any way from the credit due to those who labored so earnestly and arduously to attain the co-operative action in the Seminole area, it must be said that what was accomplished there was in the nature of emergency co-operation which marked little or no progress in the direction of permanent correction of the evils complained of. The same point holds in connection with the co-operative curtailment of production in California and one or two other areas where, ownership being limited to a few, co-operation was proportionately less difficult. The progress made in these instances, indicating as it does an awakening realization among oil producers of the necessity for control and a growing spirit of mutual confidence, is encouraging, but it falls far short of what is needed. We must have co-operation to prevent emergencies, rather than co-operation in emergencies to prevent utter demoralization and disaster. The gentlemen who participated in the many Seminole conferences would, I think, all testify to the many obstacles to agreement—in some cases unsurmountable—with which they were confronted and that the results fell far short of being all that the industry needed.

"There may still be those who will contend that the present emergency will pass, and with it, the need for co-operation and control, but many careful students of the industry believe that the application of science to the finding of oil has so facilitated its discovery that the industry is now permanently threatened with a supply in excess of demand so long as potential areas in the United States remain unexplored, unless means are found to control development and production.

"The time to effectively control the production of an oil pool is before it is found, and, where there are more than a very few interests involved, it is the only time that it can be done.

"A policy of unit development or the unitizing of potential producing areas before development is not new, but programs so far presented for its universal application have met with overwhelming opposition—probably because they involved compulsion. There have been a few cases where operators have voluntarily pooled their interests in advance of development, and I am convinced that the general adoption of such voluntary action would provide a permanent and effectual cure for most of the ills of the industry, all of which arise from one source—unreasonable competition. Eliminate such competition—and oil pools will be developed in a scientific, orderly and economic manner, with a much larger recovery of oil from a much smaller number of wells and the fullest practicable utilization of the gas, thus reducing both development and operating costs and waste of gas, and adding largely to the nation's recoverable reserves of a natural resource essential to the prosperity, happiness and defense of its citizens.

"Assuming a realization throughout the industry of the advantages of such pooling of interests in advance of development, apparently little would stand in the way of its adoption except differences of opinion among owners of both working and royalty interests as to the relative values of their respective holdings. It would seem that, if what is to be gained is compared with the concessions which might have to be made to reach an agreement, it would show how short-sighted it is to let such differences stand in the way. The oil producer relies upon the law of averages, and, if the practice of pooling interests in advance of development was universally, or even largely, adopted, the law of averages would work just as effectively as it now does, where each producer operates independently under conditions of intensive competition, with all of its accompanying evils.

"The disposition of the oil as produced would be made a part of the pooling agreement. This might involve some difficulties, and I realize other objections can be made, but I repeat that in comparison with the gain to be derived all these difficulties should fade into insignificance. Such a program may not appeal to the ambitious individualist who insists on maintaining absolute independence of action, but I am sure it would appeal both to the stockholders of oil companies and to the people of the United States, if they realized all that it would mean to them."

Mid-Continent Oil & Gas Association

(This space contributed by a member of The Mid-Continent Oil & Gas Association)

is moving in rig, location 150 feet to north and east lines of 20-acre tract.

Claude Smith and The Texas Company's No. 1 M. E. Lancaster, Dillard Cooper Survey, Lockhart Field, has been spudded in, location 2,280 feet to east of road and 150 feet to south line of farm.

The Texas Company's No. 1 F. C. Tease, John R. Miller Survey, Lockhart Field, location 150 feet to north and west lines of 50-acre tract in southwest corner of survey, is erecting derrick.

Davis & Ford's No. 1 J. M. Young, John R. Miller Survey, 150 feet to east and south lines of 46-acre lease in the new Lockhart Field has derrick up and rig ordered out.

Dr. J. H. Dufner and J. Shoenberg have made location for No. 1 I. Huff, 1 mile north of Joe Bruner's No. 1 Davis in the Bruner Field, 1 mile north of Lockhart.

Hidalgo County

Queen City Oil & Gas Co.'s No. 2 American Rio Grande Land & Irrigation Co. is location in Survey 82, Lot 1.

Nueces County

Keith & Kaye's No. 1 William Gingrich. Nueces County, J. Kuhler Survey, is location 200 feet to south and east lines.

Webb County

Aviator Gas Co.'s No. 1 A. M. Bruni, Survey 2,083, located 550 feet to east line and 1,000 feet to south line, has derrick up.

Cole Petroleum Co.'s No. 60 Benavides, Survey 412, Cole Field, is location 160 feet to north line and 460 feet to east line.

Houston Oil Co.'s (Sun) No. B-2 Lopez, Survey 319, Block 3, Cole Field, Webb-Duval Counties, is location 155 feet to northeast and southeast lines.

Houston Oil Co.'s (Humble) No. 3 Cuellar, same field, Cuellar grant, Share 1, is moving on 3,992 feet to northwest lines and 1,601.4 feet to northeast lines.

Zavala County

Tritex Oil Co.s No. 3 West in the new gas field opened in Zavala County is location 1 mile from No. 2 recently completed.

Cole Gas Field—Duval

Magnolia Petroleum Co.'s No. 5 Benavides, Block 2 O'Hern & Seacord Subdivision, location, 125 feet to northeast lines and 600 feet to northwest lines; No. 1 A. M. Bruni, Survey 15, Block 10, located 150 feet to northeast lines and southeast lines has derrick up.

Humble-Reiter-Foster Field

Humble Oil & Refining Co.'s No. 8 Kohler, Survey 405, location, 150 feet to east line and 450 feet to south line.

Randado Field—Jim Hogg

Moody Corp.s No. 15 Palacious, Survey 291, Block 22, location, 450 feet to east line and 150 feet to north line. Magnolia Petroleum Co.'s No. 37 Merchants State Bank, Survey 415, located 150 feet to south and west lines, in sand at 1.198 feet, tested dry and is drilling at 1,295 feet.

Schott Field—Webb

Magnolia Petroleum Co.'s No. 1 Garcia, Survey 53, located 200 feet to south line and 500 feet to east line, at 4.194 feet total depth, is fishing for 131 feet of 3-inch drill stem; No 1 Garcia, Survey 58, located 150 feet to north line and 1,620 feet to east line, has derrick up.

Albercas Field

Newton Drilling Co.'s No. 2 Bruni, Block 65, located 1,770 feet to south line and 150 feet to east line, is drilling at 400 feet. O. W. Killam's No. 8 Bruni, Block 64, located 1,470 feet to south line and 75 feet to west line, in sand at 2 176-82 feet, tested 1,380 feet of oil. Killam-Simms' (Maddox) No. 2 Bruni, Block 65, located 1,170 feet to south line and 150 feet to east lines, is drilling at 1,500 feet.

Aviator or Bruni Tracts

Salley and others' (Radio), No. 8 Puig, Block 3, location 150 feet to north and west lines.

Cole Field No. 2

Cole Petroleum Co.'s No. 57 Benavides, Survey 412, Block 3, located 361 feet to east line and 162 feet to south line, has sand at 2,330-38 feet and set casing with 800 feet of oil in the hole. No. 58 Benavides, Survey 412, Block 3, 460 feet to east line and 160 feet to north line, is rigging up. No. 59 Benavides, Survey 412, Block 3, is location 760 feet to east line and 160 feet to south line, and is rigging up. Magnolia Petroleum Co's No. 1 Valdez, Survey 754, located 150 feet to south and west lines, set casing at 2,328 feet.

Mirando Valley—Zapata

William R. Jewell's No. 2 Hinnant, Survey 10, Block 4, located 235 feet to southwest lines and 150 feet to southeast lines, has been spudded in.

Charco Redondo Field

W. R. Duke's No. 1-B J. M. G. Martinez, Block 17, W. R. Duke Subdivision, 150 feet to southeast lines and southwest lines, is drilling at 500 feet.

Dale Field—Caldwell

Fred Adams' No. 1 O. T. Moore, 600 feet from The Texas Company's O. T. Moore, has been spudded in. The Texas Company's No 6 W. N. Osteen, Swearingen Survey, is location 620 feet to northwest lines and 150 feet to southwest lines; No. 7 Lackey, J. Gilbert Survey, is location 150 feet to south and west lines.

Luling Field

Magnolia Petroleum Co.'s No. 1 Daisy Hughes is location; No. 12 W. J. Tiller, John Henry Survey, is drilling at 1,940 feet. United North & South's No. 1 Kelly is drilling in schist at 7,600 feet; No. 2 Tiller is drilling at 7,245 feet, also in schist.

Bruner Field

Lu-Tex Oil Co.'s No. 1 Wilson, A. Floyd Survey, 2 320 feet to east line and 200 feet to south line and 400 feet north of No. 1 Davis has moved rig back from No. 1 Davis to resume drilling. M. O. Rayor's No 1 M. August, A. Floyd Survey, 150 feet to southwest and southeast lines, has derrick up.

Lockhart Field

The Texas Company's (formerly Dr. James H. Bute and others) No. 1 Branyon, R. B. Jarmon Survey, 166 feet to south line and 361 feet to east line, at 2,243 feet made 670 bbls. in 22 hours with drill stem still in hole.

Southton Field—Bexar

George E Ginter's No. 1 Herman, J. Montes Survey, Block 15, located 150 feet to south and west lines, has set casing at 530 feet.

Kingsville Field—Kleberg

Humble Oil & Refining Co.'s No. 5-A Dennett, Section 39, Block 1, located 400 feet south of No. 2 Dennett, is drilling at 258 feet; No. 2 Kivlin, Section 39, Block 5, located 100 feet south of north line and due south of No. 1-A Dennett, is rigging up.

Saxet Field—Nueces

Alamo Drilling & Leasing Co.'s No. 1 Gallagher, Survey 158, is standing at 150 feet Saxet Oil Co.'s No. 3 Weil, is milling through casing at 2,450 feet, total depth 2,550 feet. The Texas Company's No. 1 State, Survey 689, located 150 feet to west line and 425 feet to south line, is drilling again after setting surface casing.

Refugio Field—Refugio

Heap & Retherford's No. 1 Strauch, Lot 13, Refugio Townsite, center of block and in the north end of the field, at 3,670 feet has set casing. Houston Oil Co.'s No. 1 M. F. Lambert, D. Fox Survey, 500 feet to CSL, has set casing at 2,011 feet. Houston Gulf Gas Co.'s No. 1 V. Hallinan is drilling at 2,700 feet.

NORTH LA.-ARK.

(Continued from Page 57)

in Section 24-17-9, Webster Parish, was abandoned at 1,469 feet, at which depth it had been shut down since December 14.

Sinclair Test Gets Gas

Sinclair Oil & Gas Co. did not make as deep a test as anticipated on its second completion of No. 7 A Berry, Section 33-15-15, Ouachita County end of the Smackover Field, but finished it at 2,656 feet making 5 000 000 feet of dry gas at 135 pounds I.R.P. in 16 feet of sand. It was a 400-bbl. producer on first completion in 1925 at 2,405 feet; showed gas on drill stem test at 2,541-69 feet and tested 3,000,000 feet of gas at 2,640-53 feet. In the old El Dorado south pool, Mountz and others' No. 6 Pratt, Section 8-18-15, was completed during the week pumping 6 bbls. of oil and 100 bbls of salt water, total depth 2,205 feet. It had been under way for over a year.

East Texas gas territory added two small wells. Clark and others completed No. 4 Furrh in the James Short Survey in the shallow Waskom sand making 500,000 feet of gas at 994 feet, and in Panola County The Texas Company's No. 3 G. W. Brumble in the Evans Brackins Survey gauged 1,343,000 feet, total depth 1,003 feet.

Daily Runs Recover

Although there were sharp declines in the daily average runs of three North Louisiana pools, rehabilitation of Smackover wells put off production by the storm of April 23, and the new deep sand production in Champagnolle were sufficient to show an increase in shipments for the Shreveport division as a whole. The daily average pipe line runs for the week were 128 920 bbls., compared to 124,975 the week before with Louisiana showing a decline of 1,665 bbls. and Arkansas an increase of 5,610 bbls. Louisiana runs were 44,815 bbls. compared to 46,480 bbls. and Arkansas 84,105 bbls. compared to 78,495 bbls.

Caddo light oil runs dropped back into four figures after running in five since last July when the Pine Island deep stuff was tapped, the average for the week being 9,865 bbls., a decline of 300 bbls. Cotton Valley light, the new deep stuff, dropped 840 bbls. to a daily run of 2,785 bbls. and Urania shipments averaging 6,765 bbls. were 545 bbls. under last week's average. Small increases amounting to scarcely more than ordinary fluctuation were noted in Caddo heavy, DeSoto-Red River and Elm Grove, while the declines in Homer, Haynesville, Bellevue and Cotton Valley heavy were of the same caliber.

El Dorado and Bradley production in Arkansas had a slight upward turn while Smackover light increased 450 bbls., and the movement of heavy oil jumped up 2,145 bbls. Due to Rushing and others' deep sand completion in Champagnolle and the two other good wells preceding it, runs in that pool show an increase of 3,000 bbls., the daily average of 6,300 bbls. being the best the field has done so far. Daily average runs from the several pools in the district were:

Louisiana	
Caddo, light	9,865
Caddo, heavy	3,895
Homer	4,415
Haynesville	6,310
DeSoto-Red River	4,190
Elm Grove	580
Bellevue	1,050
Cotton Valley, light	2,785
Cotton Valley, heavy	4,400
Urania	6,765
Pleasant Hill	560
Total	44,815
Arkansas	
El Dorado	5,320
Smackover, light	7,580
Smackover, heavy	60,090
Stephens	1,050
Nevada County	1,400
Lisbon	2,240
Champagnolle	6,300
Bradley	125
Total	84,105
Both States	128,920
Last week	124,795
Increase	3,945

NORTH LOUISIANA

Bossier Parish

Cartersville—Delaware-Louisiana Development Co.'s No. 1 Bollinger, Section 38-23-11, set 12½-inch surface string at 300 feet and is drilling at 920 feet. Natural Gas Products Co.'s No. 1 United States Government, Section 31-23-11, cemented 6-inch at 3,065 feet.

Elm Grove and Sligo—R. O. Roy's No. 1 Caplis, Section 25-16-12, is shut down at 800 feet. Sligo Syndicate's No. 2 Skannal, Section 14-17-12, is blowing 15,000,000 feet of gas with salt water from 1,635 feet and is arranging to kill the well and case off the water. Woodley Petroleum Co.'s No. 1 Whitehurst, Section 35-16-12, is drilling shale at 1,737 feet.

Caddo Parish

Greenwood—Belchic & Laskey are drilling at 2,480 feet on No. 4 R. T. Sharp, Section 10-18-16. Gross and others' No.

Old Timer Says—

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are fine for shutting in gas wells where oversize hole or soft formation exists."

Get a Parmaco *and be safe.*

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PARKERSBURG, W. VA.

"The House of Courteous Service"

1 Baker, Section 35-17-16, is waiting orders after a salt water test at 1,148 feet.

Pine Island—Dixie Oil Co.'s No. 9 Clark, Section 14-21-15, is in the red beds, drilling shale at 3,986 feet. Gulf Refining Co.'s No. 12 Tyson, Section 14-21-15, is a fishing job at 3.819 feet with tools lost. Magnolia Petroleum Co. is drilling sandy shale at 4,104 feet in No. 22 Robertshaw, Section 23-21-15. Simms Oil Co. cemented 6⅝-inch casing at 2,206 feet on No. 1 Glassell, Section 23-20-15.

LaSalle Parish

H. F. Taylor's No. 7 Urania, Section 19-10-2e, is shut down at 1,500 feet.

Monroe District

Morehouse Parish—Southern Carbon Co.'s No. 1 Davis, Section 21-20-4, is drilling at 200 feet.

Ouachita Parish—Jordan Drilling Co.'s No. 1 Coll, Section 50-18-4, is drilling at 1,400 feet. Montgomery and others cemented 6-inch at 2,148 feet on No. 1 Johnson, Section 30-19-4. The Palmer Corp.'s No. 1 Kate Cole, Section 26-20-4, has 6-inch cemented at 2,132 feet.

Union Parish—Industrial Gas Co. is rigging up to drill No. 1 E. Harris, Section 24-20-3. United Carbon Co. is drilling below 12½-inch surface string cemented at 197 feet on No. 1 Trimble, Section 19-20-4.

Richland Parish

Dixie Oil Co. is drilling No. 1 McCoy, Section 29-16-6, at 2,567 feet. W. C. Feazel has derrick up for No. 1 Pardue, a new location 220 feet north and 1,180 feet east SW cor., Section 32-16-6. Feazel & Hemler's No. 1 Pardue, Section 21-16-6, got the drill stem stuck at 1,693 feet. Gulf Refining Co.'s No. 1 Rhymes, Section 28-17-6, is drilling lime at 3,400 feet. Moody & Seagraves cemented 6-inch casing at 2,293 feet on No. 1-B Sartor, Section 9-16-6. Natural Gas & Fuel Corp.'s Nos. 3-C and 4-C Thompson, Section 21-16-6, are still pumping mud into the offset crater of No 1. Thompson. Ruston Drilling Co. is down 2,310 feet with No. 1-B Sartor, Section 9-16-6. Southern Carbon Co.'s No. 1 Sartor, Section 9-16-6, is drilling at 2,340 feet.

Sabine Parish

Magnolia Petroleum Co. cemented 8⅛-inch casing at 3,150 feet on No. 1-B Hall, Section 33-10-12.

Webster Parish

Cotton Valley—Dixie Oil Co. cemented 12½-inch surface string at 600 feet on No. 1 Cox, Section 15-21-10, and is drilling at 1,250 feet. Humble Oil & Refining Co. has rig up to drill No. 3 R. R. Cox, Section 22-21-10, and is drilling anhydrites at 4,144 feet on No. 2 Webb, Section 14-21-10. Louisiana Oil Refining Corp. set 451 feet of 12½-inch surface casing on No. 5 Crichton, Section 21-21-10, and is drilling at 1,500 feet; No. 1 Davis, Section 23-21-10, is in lime at 4,520 feet and No. 4 Lindsey, Section 22-21-10, is in lime at 2,490 feet. Magnolia Petroleum Co. has rig up for No. 2 Coyle, Section 21-21-10, and for No. 5 W. Cox, Section 15-21-10, and No. 5 S. J. Merritt, Section 14-21-10; No. 3 Aarnes-Cox, Section 22-21-10, is in sandy shale at 1,874 feet; No. 1 D. G. Cox, Section 22-21-10, has 3,500 feet of water in the hole and a small show of gas, total depth 4,752 feet and No. 1 J. M. Mixon, Section 22-21-10, is milling on junk at 4,347 feet. Ohio Oil Co. cemented 12½-inch surface string at 451 feet on No. 39 Bodcaw, Section 15-21-10, and is drilling at 1,352 feet; Nos. 40 and 41 in the same section cemented 12½-inch surface casing at 450 feet. Palmer Corp.'s No. 1 Mixon, Section 22-21-10, is drilling lime at 3,349 feet, and Woodley Petroleum Co. is drilling No. 1 Lewis, Section 15-21-10, at 2,220 feet.

ARKANSAS

Ouachita County

Smackover—Little Fay Oil Co.'s No. 7 Robertson, Section 25-15-16, cemented 6⅝-inch at 2,028 feet. Ohio Oil Co.'s No. 7 Cramer, Section 22-15-16, is in the red beds at 3,357 feet. Skelly Oil Co. set 60 feet of 10-inch surface casing in No. 10 Umstead, Section 33-15-15, and is drilling at 200 feet.

Union County

Champagnolle—Arkansas Drilling Co.'s No. 1 Carroll, Section 1-17-14, is down 1,200 feet. O. W. Estes is drilling No. 1 Rowland, Section 14-17-14, at 2,110 feet. H. L. Hunt has rig up for No. 1 J. D. Gregory, Section 10-17-14. E. M. Jones has gone back to No. 1 Stegall, Section 22-17-14, which he abandoned as a salt water test at 3,250 feet, and is arranging to go deeper. Lion Oil Refining Co. set 6⅝-inch casing at 3,192 feet on No. 1 Rowland, Section 15-17-14, total depth 3,205 feet and has derrick up for No. 2 and No. 3 on the same lease, the latter being a new location 150 feet south and 200 feet east NW cor. NE NE, in the same section. Magna Production Co. has rig up for No. 2 Dumas, Section 11-17-14, and No. 4 is a derrick in the SE cor. SW NW of the same section. Magnolia Petroleum Co.'s No. 3 Carroll, Section 1-17-14, has rig up ready to drill. C. E. Murdock is drilling No. 2 J. N. Gregory, Section 10-17-14, at 2,015 feet. Ohio Oil Co.'s No. 1 T. E. Adams, Section 11-17-14, is a rig; No. 1 Lockner, Section 11-17-14, is a derrick; No. 2 W. Pumphrey, Section 1-17-14, is drilling at 1,730 feet; No. 1 W. S. Rowland, Section 15-17-14, has rig up and No. 1 R. A. B. Smith, Section 1-17-14, is drilling below surface casing depth. Pure Oil Co.'s No. 2 Gregory, Section 11-17-14, set 385 feet of 10-inch surface casing and is drilling at 1,075 feet; No. 3 set 188 feet of 10-inch and is drilling at 1,700 feet; No. 4 Gregory in Section 10-17-14, is drilling below surface casing depth and No. 5 is a derrick. Alfred Rovenger has begun drilling No. 1 Perdue, Section 10-17-14, a rig since February 1, and with 10-inch surface string cemented at 155 feet is drilling. Rushing and others are drilling No. 2 Gregory, Section 11-17-14, at 2,763 feet, and Timberlake and others' No. 1 Dumas, Section 11-17-14, is drilling at 2,160 feet.

Smackover—Lion Oil Refining Co. is drilling No. 3-H Murphy, Section 9-16-15, at 2,600 feet.

EAST TEXAS

Harrison County

Magnolia Petroleum Co. is coring at 2,712 feet on No. 2 A. G. Vincent in the R. W. Bedford Survey.

Panola County

R. E. Davidson and others set two joints of 10-inch surface casing in No. 1 Johns, W. H. Woodley Survey, drilled to 1,093 feet and are arranging to test sand at 1,082 feet. S. H. Gardner and others claim to have an oil showing at 2,302 feet in No. 3 Cavin, B. C. Jordan Survey. Lewellen & Hasenfuss' No. 1 Hill in the E. F. Mitcheson Survey is shut down at 1,800 feet. Magnolia Petroleum Co is reaming No. 1 T. C. Adams in the J. M. Birdsong Survey, total depth 2,631 feet; No. 1 Martha Richardson, Benson Lovell Survey, is drilling at 1,990 feet; No. 1 Leigh Trosper, B. Stevenson Survey, is fishing for 6⅝-inch casing total depth 2,618 feet, and No. 1 S. R. Vance, J. Womack Survey, is drilling at 1,912 feet. Natural Gas Products Co.'s No. 4 Roquemore in the B. C. Jordan Survey, is drilling at 750 feet with 10-inch surface string cemented at 43 feet. The Texas Company is rigging up on No. 4 Brumble, 720 feet west and 530 feet north SE cor. J. Womack Survey.

LA.-ARK. WILDCATS

(Continued from Page 57)

in all its more than 20 years of oil and gas history. A DeSoto Parish well that has been carried on the records for several months though it has not been active was dropped when Reliance Drilling Co.'s No. 1 Jones, Section 8-11-14, formerly listed as Bond & Evans' No. 1 Jones, was written off as a dry hole and abandoned at 3,018 feet. Bruton and others' No. 1 Red River Farms in Section 2-17-26, Miller County, Arkansas, was abandoned in the red beds at 3,409 feet without having made a test all the way down and W. R. Keever's No. 3-B Ezell, Section 12-17-15, Union County, was scarcely better, pumping 9 bbls. of oil and 300 of salt water from 2,129 feet. Keever has completed a number of small producers in this section which might be classed as edge wells on the extreme southern fringe of Smackover territory but beginning about three months ago each successive completion has been a little worse—more salt water—than the last one and it would not be surprising if he stopped drilling after completing the one he has under way at present.

Salt Water In Greenwood

In the Greenwood district of Caddo Parish, Greenwood Production Co., Wm. Gross and Magnolia Petroleum Co. all had halt water tests. Greenwood Production Co. abandoned No. 1 Cushman & Bridges, Section 15-18-16, at 923 feet after testing dry at 912; Magnolia Petroleum Co. No. 2 Bell, Section 4-17-16, was dry and abandoned at 3,225 feet, about as deep as anyone has ever gone in that part of the parish, and Gross' No. 1 Baker in Section 35-17-16, just outside the town of Greenwood, is waiting orders after testing salt water at 1,148 feet. The Texas Company has resumed drilling on No. 1 Myers in Section 15-22-7 of Morehouse Parish, several miles east of the nearest production in the Monroe gas field, after a test of sand at 2,530 feet, total depth, and had made 15 feet more hole at the time of the last report.

A number of Richland land owners, chiefly the Sartors, have organized the Bouef River Oil Co. and have made location for No. 1 Sartor 660 feet south and west NE cor. Section 9-15-6, approximately a mile south and a half mile east of 'Noe & Meredith's big completion on the Boughton land in Section 4 which extended production a couple of miles or so south and east of the nearest wells.

Enochs and others, who have a block of about 9,000 acres in Township 11, Range 11 and 12, have made location for the well called for in their lease contract and will drill on the Curry land in Section 39-11-12, Tensas Parish. Check location has not been reported but the drilling clause calls for a 3,000 foot test and derrick is up.

Grier and Gault evidently plan a deep test on their second effort in Winn Parish, No. 2 Bodcaw, Section 9-11-4, as they set 15½-inch casing for surface string which will enable them to run 4 strings, if necessary, though 4 strings have rarely been used in this part of the country. They will try to locate the source of a very pronounced oil show occurring in a well drilled in that locality about a year ago.

NORTH LOUISIANA

Bienville Parish

S. P. Borden's No. 2 L & A, Section 1-15-8, is shut down at 1,750 feet. Humble Oil & Refining Co. No. 1 Anderson, Section 29-18-5, is in sandy lime at 3,300 feet.

Bossier Parish

H. S. Goodwin is drilling No. 3 Curtis, Section 2-16-13, at 1,950 feet, Wm. Gross, drilling for DuPont interests, is testing No. 5 Hunter, Section 14-16-12, at 1,925 feet, and No. 1 Stewart, Section 15-18-12, is drilling at 2,200 feet. D. P. Johnson's No. 1 Caddo Industries, Section 13-17-13, is in chalk rock at 1,520 feet. Triangle Drilling Co. No. 1 Bulkley, Section 9-20-13, is drilling at 2,200 feet. Walker and others, whose No. 1 Antrim in Section 28-22-13, has recently resumed drilling, tested dry at 2,735 feet corrected depth and is fishing for swab, total depth 2,737 feet.

Caddo Parish

J. T. Cox is drilling No. 1 Hall, Section 5-15-16, at 1,109 feet. Empire Gas & Fuel Co.' No. 1 Nicholson, Section 33-17-14, is in hard lime at 3,293 feet.

Caldwell Parish

Greenwood Production Co. has mudded off a salt water sand at 1,627-37 feet in No. 1 Caldwell Lumber Co., Section 27-13-5, and is on a rock at 2,479 feet.

Claiborne Parish

El Dorado Chief Oil Co. No. 1 Jones, Section 8-20-6, is in chalky shale at 2,310 feet.

Catahoula Parish

Leonard Petroleum Co.'s No. 1 Knott, Section 32-11-8, is drilling at 4,730 feet.

The Texas Company cemented 15½-inch casing at 195 feet on No. 1 Tensas, Section 4-10-6.

DeSoto Parish

Gulf Refining Co. cemented 6⅝-inch casing at 2,363 feet on No. 35-A Jenkins, Section 35-13-12. Williams and others have 104 feet of 12½-inch surface casing cemented in No. 2 Fortson, Section 4-12-11 and are drilling at 900 feet.

East Carroll Parish

Palmer Corporation has cemented 6-inch casing at 2,347 feet on No. 1 O'Brein, Section 7-19-11, to test sand that showed a little gas, total depth 2,350 feet. The Texas Company's No. 1 Boone Live Oak Planting Co., Section 11-20-12, is on a rock at 1,994 feet.

Franklin Parish

Louisiana Petroleum Co. is drilling No. 1 Daily, a new test 200 feet south and east NW cor. SW Section 6-11-7.

Grant Parish

Swope and others have derrick up for No. 6 Fee, 130 feet north and east SW cor. SW NW Section 17-9-1e.

Monroe District

Morehouse Parish—Elbert Petroleum Co.'s No. 1 Morehouse Planting Co. Section 40-19-7, is drilling at 2,223 feet. Gulf Refining Co. is drilling on a rock at 2,348 feet in No. 1 Higginbotham, Section 42-20-7. The Texas Company's No. 1 Myers, Section 15-22-7, is drilling at 2,543 feet. United Carbon's Co.'s No. 1 Bastrop Pulp & Paper Co., Section 18-21-6, is drilling at 2,575 feet.

Ouachita Parish—Phillips and others' No. 1 School fee, Section 16-16-4 has 8-inch cemented at 820 feet. Pioneer Oil & Gas Co. is rigging up to drill No. 1 Nolan, Section 17-18-4. J. P. White's No. 1 Schmidt, Section 3-15-4, is in gumbo at 2,962 feet.

Union Parish—Industrial Gas Co. is rigging up to drill No. 1 E. Harris, Section 24-30-3. Natural Gas Producing Co. has derrick up for No. 1 Pace, 660 feet south of the center of Section 35-22-3.

Rapides Parish

Glenmora Petroleum Co.'s No. 1 Fee, Section 1-2s-2w, is shut down in gummy shale at 3,860 feet. Minnesota Oil Co. No. 2 Wettermark, Section 13-5-4, is shut down at 2,400 feet waiting orders after a drill stem test showed salt water.

Richland Parish

Bouef River Oil Co. has derrick up for No. 1 Sartor 600 feet south and west NE cor. Section 9-15-6. Gulf Refining Co.'s No. 1 Millsaps, Section 8-17-6, is drilling shale and lime at 3,540 feet. Moody & Seagraves are fishing for 15 joints of 2½-inch drill stem lost in No. 1 McDonald, Section 9-15-5, total depth 2,754 feet.

Sabine Parish

R. L. Gay's No. 1 Mansfield Hardwood Lumber Co., Section 15-7-14, is drilling at 2,548 feet. The Texas Company's No. 1 Hamlin, Section 28-10-13, is in sandy lime at 2,422 feet. Zwolle Oil & Gas Co. is arranging to set 4½ inch casing at 3,860 feet on No. 1 Bowman-Hicks, Section 14-7-14, total depth 3,931 feet.

Tensas Parish

Enochs and others have location in Section 39-11-12 for No. 1 Curry but there is no check on it this week.

Winn Parish

Calvin Oil Co. has 60 feet of 10-inch surface casing cemented in No. 1 L & A, Section 9-11-4. Grier & Gault cemented 42 feet of 15½-inch surface casing and are drilling at 250 feet on No. 2 Bodcaw, Section 9-11-4.

ARKANSAS

Bradley County

Hurley and others' No. 1 Southern Lumber Co., Section 26-15-10, is shut down with 10-inch casing set at 21 feet waiting for new derrick to replace the one blown over by the recent windstorm. Johnson & Adams claim to be in gas rock at 3,150 feet and are coring No. 1 Southern Lumber Co., Section 12-12-12.

Dallas County

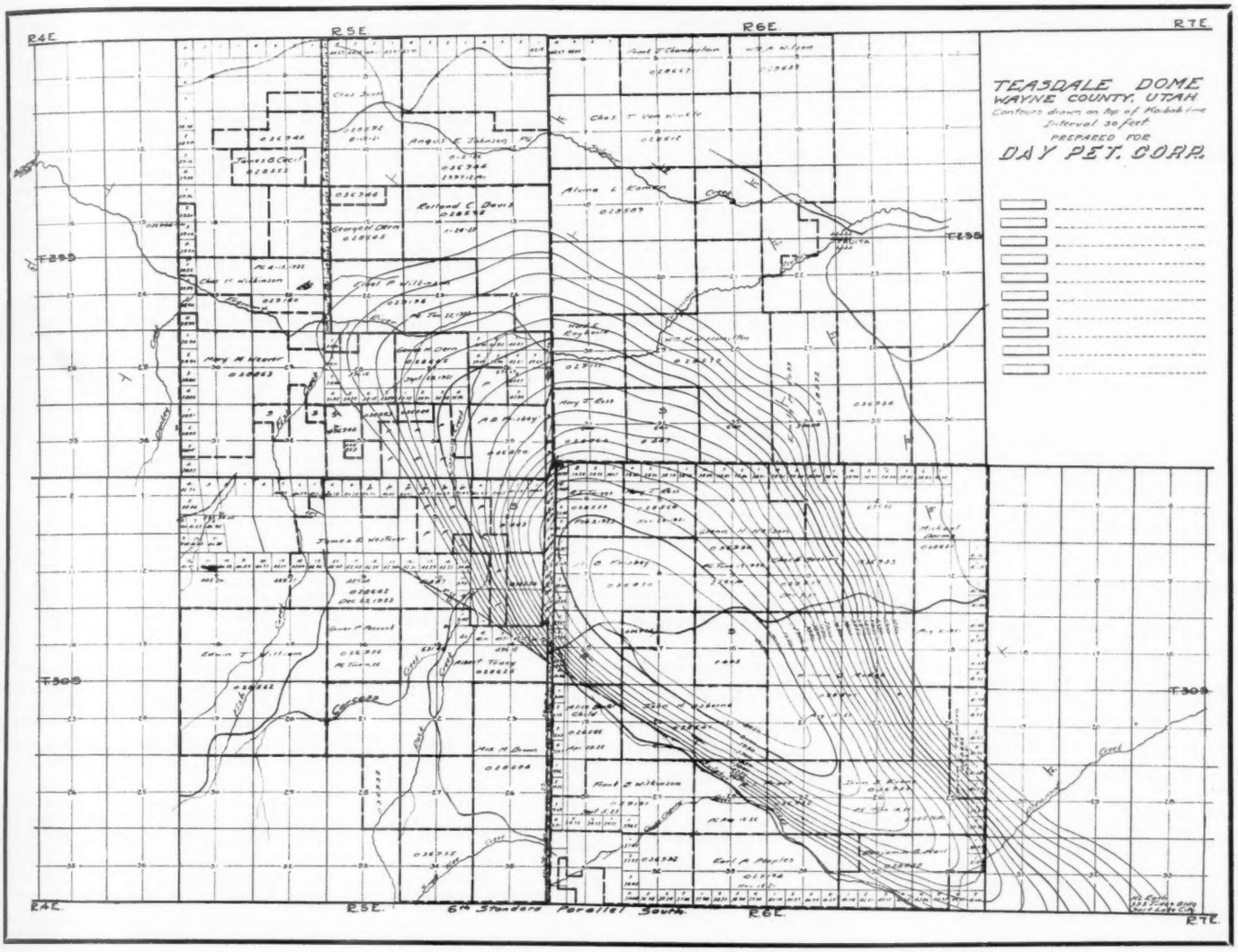
Decman and others' No. 1 Hillman, Section 20-10-13, is shut down at 1,880 feet.

Nevada County

McDonald and others' No. 1 Pelt, Sec-

(Continued on Page 189)

WILDCAT STRUCTURE



LOCATION

The Teasdale Anticline is located in Wayne County, Utah.

STRUCTURE

The Anticline is very large, containing about twenty thousand acres within the limiting contour line. The closure is in excess of fifteen hundred feet.

STRATIGRAPHY

Coconino sandstone of Triasic age is exposed on the surface with the red beds forming the outer skarps. The drilling objectives would be the Kaibab lime, Goodridge sand and lower objectives in the Pennsylvanian. To completely test the structure to the oil horizon found at Moab, a well 4000 feet deep would be required with several chances for production above this depth.

FUEL, WATER AND TRANSPORTATION

Wood is available as fuel, or the well can be drilled with a gasoline engine. Water is scarce during the summer and would have to be stored in a small reservoir. Rail transportation is about sixty miles away, and fair auto roads lead to the top of the anticline.

CONCLUSIONS

The structure is large and has unusual closure. It is one of the best structures known in Utah having the Pennsylvanian as the objective. Oil is being produced from the Kaibab lime at Virgin City to the south and the Pennsylvanian has produced oil from the upper section at Bluff, Utah, and from the lower section on the Cane Creek Dome near Moab. The Teasdale anticline being a much better structure than any thus far drilled in Utah, should have a fair chance of producing oil.

TERMS

Owing to the fact that we control most of the land on this structure, we are in a position to turn over several thousand acres of the best land in exchange for a test well. Enough land can be sold from what we give the operator to companies now interested in Utah to pay most of the drilling cost. We want a live operator on this one who can see the opportunity to make money on it and will push the job through. If it appeals to you, I suggest wiring in as the mail inquiries on previous ads have been so numerous that a delay in replying has resulted.

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6 lines	2.10	3.60	5.10	6.60
7 lines	2.45	4.20	5.95	7.70
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Active Demand in Chicago Market

Orders Came From All Parts of Territory. Prices Firmly Held. Fuel Oil Steady; Kerosene and Gas Oil Firm

By J. B. Waldo

CHICAGO, May 7.—The week opened with an active demand for gasoline Some reports indicated that the actual business done was a little less than for the same time last week, but there was a good business which with many sellers was equal to any had this year. The orders came from all parts of the territory and in many cases were wanted at once as the buyers stated their supplies were light and going rapidly. Prices were firmly held and some refiners who had been at 7 cents for the U. S. Motor gasoline advanced their price an eighth of a cent, but others were still holding their old price although expecting instructions to advance at any moment. It is very improbably that with the steadily increasing movement there will be any refiner quoting a 7-cent price for the U. S. Motor grade in 24 hours.

There was about the usual proportion of the higher gravities included in the orders today and prices on these were as firmly held as for motor gasoline, but the spread was not increased by an advance in the prices of the higher gravities. Kerosene was firm and in more active demand than at the close of last week. Several refiners were asked to rush their deliveries and replied that they were doing all that they could to catch up with their orders.

Gas and Fuel Oils

There was no great activity in gas oils, the demand being rather less than expected, but prices were very firmly held by refiners. Fuel oils of the higher gravities were just about steady, although not active, but the heavier grades continued to sag under free offerings and a smaller demand. Lubricating oils moved very satisfactorily and quite a number of car lot orders for blended oils as well as for various stocks were booked by refiners. Prices obtainable were a little higher.

Weather conditions were favorable, being bright although cool in the lake regions and roads are rapidly getting in good shape. A steady demand at firm prices is looked for in the light oils with heavy fuel oils barely holding their own over the coming week.

Spot Market

The spot gasoline business all of last week was distinctly good. The weather helped by drying out the roads. The result was a gallonage that put the dealers in a better frame of mind and increased orders. The contract business was very satisfactory, few dealers failing to send shipping instructions for monthly purchases. Yet the buying was conservative. Refiners were well satisfied with the business booked for early May deliveries and adopted a tone that might be a little too optimistic but few will forget that the first week in each month is when the purchases are made by most of the substantial dealers for their requirements for at least the first half and by many for the entire period. So many distributors are now supplied for immediate needs there may come a brief period before the month is ended when the demand will be less active. The real season is still young and there is no need to rush the business or advance prices or increase refinery runs too fast.

The coming of daylight saving time has helped the gasoline demand as it lengthens the evenings and makes after dinner driving for pleasure more common. The season has made a fine beginning and the outlook is favorable. There are no large gasoline refinery stocks to be dumped on the market just when the season is beginning to show its real form. There is little possibility of large overruns by refiners. In many cases the refiners are increasing their runs just enough to care for the increased demand. More than one large refiner is buying to add to its own production. There is no excessive production of high grade gasoline crudes as some refiners whose plants are closed down find when they seek a crude supply to enable them to resume operations. So far as the West Coast is to be considered there is no danger feared now of heavy deliveries of California gasoline to the East Coast. There are some factors that might be improved but they have to do with the distributing end.

Price Situation Better

The price situation in this market showed a distinct gain. There was less hesitation to buy and better prices were obtained by the leading refiners. The bulk of the demand was for the U. S. Motor gasoline. The price at the opening of the week averaged 6⅞ to 7 cents. Two of the largest sources of supply were freely offering at 6⅞ cents, the majority were holding for 7 cents and here and there a refiner was asking 7¼ cents. The two refiners advanced their price from 6⅞ to 7 cents at the middle of the week and others went to 7⅛ or 7¼ cents. The feeling was that the market should be at least 7¼ cents and gradually the number of sellers at this price increased until at the close of the week the market was really a quarter of a cent higher with only a couple of refiners still clinging to the 7-cent price and they expected to advance to at least a 7¼-cent quotation. Quite a number of smaller plants from whom it was hoped a lower price could be had than 7⅛ cents came back on inquiry with a quotation of 7¼ cents stating they were well sold ahead and did not care to accept orders now at any less price and that price was not for prompt delivery. These replies tell the story of the market which is that as fast as the refiner secures a good line of orders he advances his price. This is usual, but the demand is so good and the supply so limited compared with the consumption that the higher price is maintained which has not always been the case. The situation as to the higher tests is rather mixed, the 60-62 400 endpoint selling best. The price range is still very narrow, the range between the quotation on the U. S. Motor and the 64-66 375 endpoint seldom being more than three-eighths cent. Prices advanced on the higher gravities with the quotations for U. S. Motor just holding their own. Offerings of the 375 endpoint are light, several refiners being occupied on export orders.

Of course at this time of the year there is always a falling off in the demand for the higher gravities, but this year there seems to be less demand for them than usual. Some marketers and even refiners not running these grades are asking higher prices than the refinery market but this is because they are buying for resale at the refiners' prices and adding their profit. The premium gasolines such as the antiknock makes are doubtless cutting into the consumption of the regular high gravities. The consumption of the specials has become quite important although there is much less talk of them than when they were a new thing. Now they are an accepted grade and most dealers carry some one of the many brands, practically every refiner of any size and some that are not so important having a special brand of antiknock or super gasoline usually at 3 cents higher. There has been some inquiry for export but the chief activity here was in the closing up of orders for cargoes, some little gasoline being picked up here and there. It was partly due to this buying there was so little transit gasoline available. But the early buying of last week included many rush orders for cars rolling, which also helped to care for the residue of the uncompleted April shipments. The local demand for the natural gasoline product was just routine here and chiefly for the absorption grades. Prices were not quite as firmly held here.

Kerosene Lagged

Kerosene lagged a trifle last week and although there was no decline in the range of prices and some refiners advanced their 41-43 an eighth of a cent, others sold freely at former prices and had caught up with their orders and could make prompt shipments. Farmers are using the tractors freely but most country dealers have a pretty fair supply and run their stocks down pretty closely before ordering so that the demand is largely for prompt delivery. There is a good deal of kerosene still to be shipped on orders. There may be some revival of the demand for export and some refiners are still seeking supplies for their own requirements. The tendency from now on will be to reduce stocks and not to add to them. There was a little kerosene available at the close of the week at 5 cents but refiners' prices ranged from 5⅛ to 5⅜ cents for the 41-43 gravity with the 42-44 grade water white kerosene quoted at 5⅝ to 5¾ cents. There was practically no business in distillates last week, just a car here and there some for other uses than heating. One railroad buys distillate to use in manufacturing illuminating gas for its coaches. There is still a small demand for distillates in some of the small local industries but many of these have turned to gas oil as a less expensive fuel.

Gas Oil Firm

Gas oil continued firm in price with a fair demand. The gas company buying has been of a routine nature. The buyers for these concerns say there is nothing in the market to induce them to stock up and they are buying for their wants only. There has been little refinery buying. Some have expected there would be some heavy buying by some large refiners with big cracking equipment such as The Texas Company, but so far their buying has not been heavy of late. On the other hand few refiners have any straightrun product to sell. Those who have quoted a price of 2⅝ cents for immediate business for resale and 2¾ cents to the consumer. It is just about impossible to sell at that price so the gas oil market is very narrow and rather in a position of uncertainty. This applies to the straightrun product either the regular 32-36 grade or the heavier gas oils. There is just a fair demand for the cracked product and the zero oils have lost most of their premiums with warmer weather. Dark cracked gas oil with no specification as to cold test has been sold here at 2½ cents and the zero oils are running along at not over an eighth of a cent above the straightrun, ordinary cold test gas oil.

Heavy naphthas are in demand and hard to buy. Prices seem out of line with gasoline quotations. Heavy naphtha sold here last week at 6¾ cents and this was a low price according to the refiner who made the sale. The seller stated he could make a lower price on 56-58 gravity than on the 46-50 gravity.

Fuel Oils Weak

Fuel oils weakened due in part to the decline in the demand and in part to free offerings by several large refiners moving their winter accumulations of heavy fuel some of it by blending it with a lighter product to bring it up to a 16 or better gravity. The larger buyers have supplied their wants over at least the first half of the month and are out of the market and the few who are buying are not taking quantities and what they do buy has to be at a low price. In fact they evidently regard the situation in heavy fuel oils as a buyer's market and act accordingly, some of them naming the top price at which they will buy and trying every device to secure a still lower figure. There are some contracts approaching revival and some of this pressure for low prices is for the purpose of making advantageous contracts later. Sales were actually made of the 18-22 heavy fuel oil with an ordinary cold test at 72½ cents and it was rumored business had been done in the blended product at 70 cents. Offers to sell 24-26 refinery fuel oil at 80 cents were in several instances returned as too high. Several estimates made by active men were that the market had dropped 5 cents a barrel in the past two weeks judging by the actual quotations made to fairly large buyers.

Lubricants

There is little new in lubricants. The shipments are not quite as heavy as a few weeks back. The demand is rather from the smaller dealers who do not stock so heavily. The consumption of motor oils is large. The situation as stocks sold by refiners to large users in car lots is still complicated by the prices named for large business and in these there is little if any real recovery. There is a good movement from compounders to the industrial plants but for these orders competition continues keen.

Discount Change

The chief change in the distributing end has been the great increase in the gallonage that has come since the advent of warm weather and better road conditions.

One of the very general discounts has been that of 1 cent a gallon on deliveries of a certain quantity of gasoline which has varied in different parts of the territory. In the country districts it has been on deliveries of 50 gallons and in this city and immediate suburbs it has been on deliveries of 100 gallons. The large distributors in this city will cease to give this discount beginning with Tuesday, May 8. This really amounts to an advance to buyers from the tank wagons as while the larger companies have adhered to the quantity, some dealers have given this discount on any quantity and others have called their tank wagon price the regular price less the discount. For example the Chicago tank wagon price is 14 cents but some companies, while this discount was allowed, have called their tank wagon price 13 cents but have not allowed the discount on 100 gallon dumps. The return to a more simple price basis is evidenced in this move. It should be understood that the Q.D.A. is in nowise affected by this change.

The local fuel oil marketers having indulged in a price war during which the 18-22 gravity fuel oil was sold at 4½ cents a gallon delivered on contract extending to November 1, next have begun to see that something better might be done than try to lose as little money as possible under conditions of their own making and have held a meeting for the purpose of getting together in an organization which should promote better business conditions.

Gasoline and Kerosene Strong in East

Fuel Oil Prices Decline 10 Cents. Bunker Oil Lowest Since May, 1922, Reflecting Venezuela and West Texas

By Special Correspondent

NEW YORK, May 7.—Strong markets for gasoline and kerosene have shared interest with a 10-cent decline in fuel oil prices in East Coast markets this week. The cut in bunker fuel oil came somewhat as a surprise to the trade, as a continuance of the $1.35 market will into the summer months had been anticipated. The market is now at the lowest point since May, 1922, and reflects the heavier imports of Venezuelan crude and the larger runs of West Texas oil, both of which have a high fuel oil content.

While the gasoline market has not continued on its upward move, recent advances have been well sustained. Harking back to the days of the wartime communiques, it might be said that the refiners are consolidating their positions in preparation for the summer drive.

While a little bearish sentiment appears to have crept into the market with respect to gasoline prices, it can be safely said that the element on the constructive side of the market is almost overwhelming. Those holding the pessimistic view have little to back up their contention aside from the fact that the market has already gone up a full cent a gallon in about a month's time, and that a reaction, therefore, is a logical sequence. Those on the bull side, however, point to the extremely strong statistical position of the market, record demand, and the indisputable fact that gasoline is by no means plentiful even at current going prices.

Unusual conservation in gasoline jobbing operations is evident in East Coast markets this week, which indicates more clearly than words just what the outlook on the near future of the market is with the large sellers. While there is a good demand from jobbers for coverage through June, there are few sellers who are willing to quote beyond the close of May.

Tank Wagon Increase?

Rumors of an impending tank wagon increase are still heard in the trade, but the situation has not yet progressed beyond the rumor stage. It is known that several refiners have had such a move under consideration for the past fortnight or more, but it seems to be generally felt that the advance in refinery prices has not yet reached the point where a higher tank wagon basis is necessary. Probably the truth of the matter is that competitive conditions in the market have been such that no refiner cares to take the initiative in starting the upward movement. There have been times during the past two years, much like those in the market at present, where one refiner has taken the lead in a tank wagon price advance, only to find himself alone at the new price, with a subsequent reduction necessitated to get his price in line again with competing refiners. Aside from these purely local considerations, however, it is probable that any increase in tank wagon prices in nearby territories would be followed by refiners and marketers operating in New York and New England as a matter of course.

Weather conditions have been little short of ideal for motoring during the past week, and this has resulted in a much heavier consumption in local territory, with refiners reporting tank wagon dumps increasing both in frequency and in gallons per delivery.

Gasoline

U. S. Motor gasoline failed to record any further advance, and is still held at 9¾ cents a gallon at principal East Coast refinery terminals. Conditions have been somewhat irregular in gasoline sales. Some refiners report that there has been no letdown in demand, while other sellers report a pronounced paucity of orders. The latter, however, explain that this is due entirely to the fact their buyers filled their tankage literally "to the brim" on April 30, many of the jobbers having covered on contracts calling for April delivery at 8¾ cents a gallon, 1 cent under the spot market at the close of the month.

Contract business for May has been written rather largely at 9¾ cents a gallon, and while there are many inquiries for June contracts, refiners as a rule are not looking beyond May 31. One seller, it is reported, is offering June contracts at 9½ cents a gallon but the price views of other sellers are more inclined to 10 cents for the June position. The pronounced firmness in motor gasoline during recent weeks had made a profound impression upon Eastern operators, and jobbers who normally would not hesitate to make short sales at this time of the year, with a 1-cent advance behind them, are changing their tactics this season.

Reports from Boston and nearby points are to the effect that while the jobbing market is nominally 9¾ cents a gallon, much of the current gallonage is being written at 10 cents. There is still a considerable element in the New York market which holds to the view that a 10-cent market at principal East Coast refineries is but a matter of time, and that the advance will certainly materialize before the close of May. There are others, however, who express the belief that the advance has run its course for the present, and that a 10-cent market at this time appears highly improbable unless the export demand should set in again at a rate which corresponded to the heavy buying during the middle of April.

California gasoline is still commanding a quarter-cent premium in this market, holding at 10 cents, and meeting with a good demand at this level. At present, the prospects for a heavy movement of Pacific Coast gasoline to the Eastern Seaboard appear more remote than at the start of the month. California refiners are not now inclined to sell under 7¼ cents, with 7½ cents the asking price in a number of cases. To add to the strength of the situation, charter rates on clean tonnage in the intercoastal trade are up, with little tonnage offered.

Tank Wagon Gasoline

Sales continue to run at a record rate for most refiners, and the outlook favors a record-breaking gallonage in East Coast territory this year. The tank wagon price is still 17 cents a gallon throughout the greater part of the territory, with about 2 cents a gallon under this figure being done on exclusive-distributor contracts These prices apply to the leading brands. The brands of some of the smaller marketers list at 15 to 16 cents at retail, 3 to 4 cents under the filling station prices on the better-known brands.

More Tank Wagons

Gasoline tank wagons are being seen on the streets of New York City in larger numbers. It has been two or three years now since the local ordinance prohibiting the delivery of gasoline in bulk in city limits was taken off. A few of the smaller marketing companies, new entries into the field, introduced tank trucks almost immediately. The larger marketers, however, were unwilling to scrap their expensive steel barrels and adopted a policy of continuing to ship in steel drums until their older equipment wore out. Instead of replacing worn-out drums, the larger companies are now delivering larger percentages of their gallonage in tank trucks, although steel-barrel delivery is still the policy of several of the larger refiners on a large part of their business.

Kerosene

Kerosene stocks at East Coast refineries are not large, and the market is strong, with water white commanding 7½ cents a gallon at Bayonne, the tank wagon quotation holding at 15 cents. It is reported that some of the East Coast refiners have been buyers of kerosene at interior markets, extra quantities being required to take care of their export contracts. Present export prices are 17.40 cents for cased standard white and 18.40 cents for water white. West Texas and Venezuelan crudes, which are being largely run at East Coast refineries at present, do not yield a large percentage of kerosene, and this has made for a tight situation in the East. Refiners are not finding it possible to buy in other refinery centers at concessions, the price trend having been upward both in the East and in the Mid-Continent during recent weeks. An easier market was expected to make its appearance at the start of the current month, but thus far there has been no general lowering of prices. Smaller yield of kerosene is indicated by the Bureau of Mines report covering March refinery operations. There appears little likelihood of any early reduction in the tank-wagon schedule in this territory, it is reported. The market did not reflect the recent advances at refineries, and refiners expect a good demand during the summer months. A good summer business has been developed at many of the vacation resort centers, particularly at the beaches and mountain camps where neither gas nor electricity are available.

Gas Oil

Strength in the position of the gas oil market has been a feature of East Coast markets during the past several months, and is expected to continue. With Eastern refiners now running largely on Venezuelan oil and the outlook favoring further expansion in this direction, signs of increasing firmness on gas and Diesel oils are discernible. The yield of gas oil from Venezuelan crude is disappointingly small, and the market has held firm for the past few months, notwithstanding the fact that a seasonal slackening in consumption normally develops at this time of the year.

Refiners report that demand for gas oil shipments has been running ahead of last year's totals, and shows no signs of any appreciable letdown. The current market for oil of 28 degrees gravity or better is holding firm at 5¼ cents in bulk at Bayonne. Refiners are not offering spot oil in large quantities, this being particularly true of the better grades. Not only are current stocks short, and production as well, but refiners are making an effort to accumulate reserve holdings for use in cracking operations during the summer months.

At East Coast refineries fuel oil production has been on the increase, while the output of gas oil has been falling, these developments being natural results of the type of crude being run most heavily at the refineries this year. With Venezuelan and West Texas crude supplanting petroleum from other fields, which contains a higher percentage of gas oil and gasoline, a continuance of the strong statistical position on gas oil is believed inevitable.

Diesel Oil

The arrival of a new 15,000-ton Diesel vessel at the port this week to enter the Grace Line's South American service, coupled with the announcement that a sister ship, also Diesel powered, will go into service in about two months, has attracted renewed attention to the steady development of the Diesel oil business.

According to one of the leading Eastern refiners, the amount of new ocean tonnage constructed last year to be powered with Diesel engines exceeded that designed for coal burning, with the trend still strongly toward the former.

Refiners have experienced a steady demand for Diesel oil over the past several months, and it is understood that aggregate tonnage is running far ahead of that for the corresponding period last year. The market has been held at the $2-a-barrel level for some months past and has held up much better than Bunker C fuel over the past year.

Diesel oil is in the same category as gas oil as far as production and stocks on the East Coast are concerned. The current output is by no means excessive, and refiners anticipate a steady market over the summer months.

Fuel Oil

Standard Oil Co. of New Jersey, followed by other sellers, reduced bunker C fuel oil 10 cents a barrel at East Coast terminals on May 5, the advance being announced on May 4, effective on the following day. The reduction was effective at New York, Baltimore, Norfolk and Charleston, and at the new price of $1.25 per barrel, the market was at the lowest level since May in 1922. A year ago, bunker C fuel was quoted at $1.75 a barrel The new price is at refinery terminals, plus the usual 6½ cents a barrel lighterage charge to bring the oil alongside in New York Harbor. There has been a good demand for fuel oil during the past week from steamship companies with the contract movement heavy. The current reduction, it is felt, adjusts the market to the lower production costs resulting from the heavier runs of West Texas and Venezuelan crudes at East Coast refineries. Competitive conditions in East Coast markets have not been particularly sharp during recent weeks. California has now been virtually eliminated as a factor in East Coast fuel oil markets by the present low quotation on bunker oil, and it is not expected that the movement of fuel oil from Mexico will show much of an increase in volume for several months.

West Texas and Venezuelan crudes yield a heavy proportion of fuel oil and this is enabling refiners to operate at a fair magin even at the present $1.25 price.

Industrial consumption of fuel oil has continued heavy, this being one of the bright features of the market. At present prices, fuel oil can more than hold its own in competition with coal as a fuel, and refiners do not anticipate any difficulty in holding their industrial business as long as conditions continue as at present. On the contrary, it is probable that fuel oil consumption will be widened further in the fall as the seasonal increases in coal prices go into effect, refiners declare.

Lubs Firm

Conditions have shown further improvement in lubs over the week, and prices are a little stronger. Pennsylvania refiners have marked up their quotations on steam refined stocks a quarter cent per gallon during the week, and this move is reflected in a tighter situation on the spot markets.

Domestic demand for motor grades has been the bright spot of the market. Weather conditions have been very favorable for mtoring during the past week, and sales of lubricating oil are mounting steadily as the touring season gets under way. Compounders bought in conservative fashion during the first quarter of

(Continued on Page 189)

Problems in Measuring Wet Gases

Irregularity of Flow, Variation in Density and Measurement at Low Pressures Complicate Work of Gasoline Manufacturer

By R. D. Turner*
Skelly Oil Co.

In the natural gas and the natural gasoline industries of today, gas measurement plays an important part. Its importance to the natural gasoline industry can well be realized when reminded of the fact, that in round numbers, one-third of the gasoline produced, or over 1,500,000 gallons per day having a value of over $78,000 even at present prices, is given in exchange for the casinghead gas. The cost of the gas is the largest single item of expense to a gasoline plant, and thousands of dollars may be lost annually through an indifferent attitude toward gas measurement. The importance of gas measurement is also reflected in the efficiency of plant operation. It is important that the plant operator know the quantity and richness of the gas he is handling in order that he may properly control the operation of his plant and obtain the highest degree of efficiency.

Air Infiltration

Since most casinghead and natural gas in the field is measured by orifice meter, the discussion in this paper refers largely to such measurement. As casinghead gas, or "wet gas" as it is often termed, is in most cases handled under vacuum, one of the first and most difficult problems pertaining to plant operation and gas measurement is air infiltration. While this may be considered an operating problem, nevertheless, it devolves upon the meter men and gas measurement department to be constantly on the alert for air leaks, and make the proper adjustments in the meter readings. Air tests should be made at least once a day, and at plants where extremely high vacuum is required, such tests should be made more often. Aside from being dangerous to plant operation, air adds excess volume to the amount of gas purchased, overloads the machinery, and if not eliminated, consumes a great part, if not all, of the annual profits of a gasoline plant.

Owing to the fact that the present type of gas meter will measure air in precisely the same manner as gas, the infiltration of air is difficult, and sometimes impossible, to detect, through the meter readings alone. However, if the chart changers are alert and on to their jobs, they can be of great assistance in the detection of air leaks, especially on settled leases, for they are familiar with the charts they are handling from day to day, and usually by observing the differential carefully, they can tell if the meter has registered a large or sudden influx of air, and any such irregularities should be immediately investigated and reported.

Oil Producer Side

As casinghead gas is the gas coming from the same sand or stratum as the oil, and since the marketing of such gas is usually subservient, or incidental, to the production of oil, many perplexing problems on this account confront the gasoline manufacturer. The success of the gasoline manufacturer depends a great deal on the co-operation given by the oil producer, the kind of tanks and equipment from which the gas may be taken, the care of oil and gas separators, etc. An arbitrary, or indifferent, attitude on the part of the oil operator, such as leaving the vacuum lines open to the air when cleaning out or running tubing, leaving gate valves and flow tanks open so that air will be carried in, cutting wells in and out without notifying the gasoline plant, will cause no end of grief to the gasoline manufacturer.

*Read before Southwestern Gas Meter Course, University of Oklahoma, April 24.

Perhaps the greatest problem confronting the gasoline manufacturer, especially during the flush production stage, is getting the gas into the plant. This problem is greatly aggravated on account of the different methods which the oil producers use in the production of their oil. Some producers desire back pressure carried on their wells, while others want atmospheric pressure, or perhaps vacuum. Some of the gas is made available from pressure tanks or suitable gas traps, while in other cases the gas must be taken from flimsy paper shell tanks, all of which make difficult the regulation of the gathering system, metering, and the processing of the gas in the gasoline plant.

During the period of flush production, the gas is usually taken from flow tanks or separators, and it is not an unusual occurrence, especially from wells that are flowing by heads, to get a slug of oil into the vacuum line, and hence, into the meter and connections, which usually necessitates a replacement of the mercury, and a general cleaning of the meter piping and fittings. To overcome this difficulty, it has been necessary in some instances, to place a scrubber tank between the flow tank and meter, and install a small drip, filled with excelsior, on each side of the meter setting. It is also difficult to get an accurate measurement from a well that is flowing by heads. When the well is flowing, gas may be passing the orifice plate at the rate of several million feet per day, forcing the differential pen to the extreme edge of the chart, and when the well stops flowing, there is hardly enough gas to make a registration on the chart. Gas flowing under these conditions usually produces a chart of the "sunflower" type which makes the calculations tedious.

Cleaning Out

After the period of flush production has passed, there usually comes a period of cleaning out and swabbing. Measuring gas from a swabbing well is perhaps the most difficult of all "wet gas" measurement, at least from a chart reading standpoint. When the swab is being pulled, a large volume of gas will be received, and when the swab is being lowered in the hole, a slight vacuum is created, which not only retards the flow of gas during this operation, but causes gas, quite often, to back flow through the meter. Like the well flowing by heads, it makes a very erratic chart, and if an accurate reading is desired, the chart should be read in 15-minute periods rather than hourly.

A much nicer chart may be had by placing "dampeners" or "deadeners" in the meter, but this practice is usually unsatisfactory as it merely retards the flow of mercury from one chamber to the other, makes the meter sluggish and consequently inaccurate, and it is therefore a question whether the gas buyer or gas seller is getting the best of the deal. It is my opinion that a much more accurate reading will be had if the meter is left to record all flows of gas, and by reading the charts, if necessary, in 15-minute periods. However, in some instances, if a record of the flow is to be had at all, it is necessary to install "deadeners" in the meter.

As a general rule, and quite different from the general practice of dry gas measurement, one meter handles all the wells on each particular lease. The number of wells usually range from 1 to 16 to a quarter section, and in some instances even a greater number. The writer is familiar with situations where as many as 23 wells feed through one meter on a quarter section. With a large number of wells feeding through a meter, it is quite probable that the flow of gas will be irregular, especially in new fields where considerable cleaning out, rod and tubing jobs, are necessary. This requires a frequent change of orifice plates, which in turn changes the value of the gas coefficient used in calculating the volumes. It is also often necessary in flush and semiflush stages to make new gravity and gasoline content tests when wells are turned in and out, as the wells may vary considerably in richness.

Measurement of gas by means of an orifice meter requires an accurate determination of the density of the gas, and this is of particular importance in measuring casinghead gas, the densities of which vary through a much wider range than those of dry gases, and where errors in gas volumes may be of considerable magnitude if densities are not properly determined. Casinghead gas will range in density from .60 to more than 2.0, as compared with air, and the determination of the specific gravity of such heavy gases is attendant with so many variables, because of condensable constituents, that unless great care and proper equipment are used, erroneous results may be obtained.

The gas testing committee of the Natural Gasoline Association of America has done considerable work along this line during the past year and a half and it is possible that some of the members of that committee who may be present may be able to give us some interesting information regarding these tests.

Pulsation

A very perplexing problem of wet gas measurement is pulsation. The principal causes of pulsation are pressure variations from the compressors or vacuum pumps, and condensation in the lines. The latter cause can usually be remedied by placing drips in the low places along the gas line. In the measurement of wet gas it is necessary to blow the drips at least once a day, and during the winter months, especially at plants handling very rich gas, it is necessary to blow them three or four times a day. There are some plants that receive a good portion of their production from the drips. It is obvious that if this condensation were left in the lines, accurate gas measurement would be impossible. We have found the orifice meter to be more satisfactory than the positive meter in the measurement of extremely rich gas. If the vacuum lines are kept free of condensation, an accurate measurement may be obtained, while with the positive meter, it is practically impossible to keep the diaphragms and other working parts free of condensation.

Pulsation caused by compressors or vacuum pumps is the most difficult to overcome. It is like trying to weigh a person who is jumping up and down on the scales. Pulsation can be eliminated in order to make a smooth chart by placing "deadeners" in the meter, but as previously mentioned, this practice is usually followed at the expense of accuracy. It has been found to be very helpful in trying to eliminate pulsation, to use a larger pipe for the meter setting than the line. For example, on a 6-inch

FIRST TEXAS GAS MADE BY SLAVES FROM COAL SHIPPED FROM GERMANY

The early romance of the first gas made in Texas, which was manufactured at Galveston by slaves with coal brought from Germany, is revealed by the change of a single word in the name of the Galveston Gas Co., and will be discussed at the annual convention of the Natural Gas Association of America in Dallas, May 7-10.

This company, which was chartered in 1854 by a special grant from the Texas Legislature, has just become incorporated and has changed its name to the Galveston Gas Corp. after operating under the old charter for three-quarters of a century.

Slaves stoking furnaces with coal brought from Germany in sailing vessels give a picture of the State's first venture. The product sold at $12 per 1,000 cubic feet and was used exclusively for illumination.

The old Galveston company owned its own slaves, paying as high as $1,000 for a good strong Negro man. And on the days when the sailing vessels came in from Germany to the Galveston Harbor, these husky black boys, naked to the waist, would heave great pipes off the ships, pipes to be laid for gas mains.

Galveston Gas Co. is the only company ever chartered by the State, and it is only since the coming of natural gas to the city, now in the process of inauguration, that the name was changed and the old charter laid aside for incorporation papers.

Four years after Galveston started in the gas business for illumination, San Antonio followed suit, organizing the first company in the city in 1858, when the city council made provision for gas to be manufactured, to be sold at more than $7 per 1,000 cubic feet. The price in Galveston had dropped from $12 to $7 about this time, too.

This was long before trains came into San Antonio and resin to make gas for illumination was brought down by ship to the Port of Indianola, a place that was wiped out by a storm many years ago. From the port, it was brought overland in wagons to San Antonio to provide what was considered the best illuminant that could be had. Later the works was changed into a coal gas plant and coal from Pennsylvania was brought down by ship to Indianola and then overland by teams to San Antonio. But the first gas was made by a set of retorts heated by a furnace which distilled resin and thus made gas for illumination only.

From that beginning San Antonio is now lighted and heated and transported by the San Antonio Public Service Co.

It was not until 1874 that Dallas got into line with an artificial gas works and by that time the price had come down to $5 per 1,000 cubic feet, and the fast growing little Texas cities were all beginning the work of manufacturing gas lights for their population.

Electricity supplanted gas to a large extent and it was not until 1909, when Fort Worth began the great modern movement of burning natural gas, that this commodity came back into its own, this time as a fuel.

Dallas received natural gas in 1910. Gradually much of Texas is changing to this mode of heating and power making.

line, to use an 8-inch setting, and on an 8-inch line to use a 10-inch setting, etc.

In recent developments of the technology of the petroleum industry, it has been shown that gas lift and repressuring have become important factors in the production of oil, which fact presents many problems to the gas measurement division in controlling the volume and pressure of the gas being injected and its subsequent return to the gasoline plant or compressor station. Steady volume and uniform pressure are essential to the successful application of the gas lift.

Type of Meters

The type of meters most generally used in wet gas measurement at the present time are the 20-inch and 50-inch differential range orifice meters. However, where exceptionally large volumes are being handled, meters with 100-inch differential range are often used, while in case of small volumes under vacuum, the 10-inch differential-range meter is often used. The 10-inch range meter is particularly adaptable at plants where extremely high vacuum is being maintained, such as at Burkburnett and the Glenn Pool. When very high vacuum is required, it is necessary, in order to reduce the friction loss to a minimum, to have as large an orifice opening in the line as possible within the limits of orifice measurement, while at the same time maintaining a differential pressure high enough to insure accuracy. Two or three inches of water differential, therefore, on a 10-inch meter would be satisfactory.

Many other problems might be mentioned if time were permissible, but in conclusion, I wish to say in summary that in the measurement of wet gas, the three factors contributing most of our difficulties, in the order of their importance, are as follows: Irregularity of flow, variation in the density of the gas, and measurement at extremely low pressures. Considerable progress in the measurement of wet gas has been made in the past few years, and I believe that with concerted effort on the part of gas men and meter companies, many of our present difficulties will be overcome in the future.

LA.-ARK. WILDCATS

(Continued from Page 182)

tion 9-15-22, plugged back from 2,424 feet to 2,110 feet and on drilling out cement tested salt water and will re-cement to bottom.

Ouachita County

Timberlake and others' Noll Carnes, Section 27-13-17, is on a rock at 1,710 feet.

Union County

Lion Oil Refining Co. has begun drilling No. 1 Nash, Section 6-17-13, in the Champagnolle district. J. O. Moore, trustee, tested dry with no show at 2,650 feet on No. 1 Pagan, Section 18-18-11, and is arranging for a drill stem test of 5 feet of sand, at 2,711-16 feet. Ouachita Natural Gas Co. has rig up for No. 1 Perdue, Section 33-16-14. Rhodes and others' No. 1 Union Sawmill, Section 14-19-11, tested salt water at 2,794 feet and is coring at 2,901 feet.

H. H. Givans of Hot Springs, Ark., says he has not abandoned his test in Section 1-3-19, Garland County, and that he expects to drill it to 3,500 feet, unless oil or gas is found at a lesser depth.

EAST TEXAS

Shalby County

Magnolia Petroleum Co. is coring No. 2 Pickering, W. J. Crane Survey, at 2,250 feet.

GASOLINE AND KEROSENE VERY STRONG IN EAST

(Continued on Page 187)

the year, being uncertain as to how early the spring demand would get under way. Judging from the number of "repeat" orders reaching the refiners this week, it is evident that the compounders were more than conservative in their early operations and that hasty replacements are being found necessary. The number of "rush" shipment orders reaching refiners during the week has reflected this condition.

Export demand for lubs has been along ordinary lines this week. There have been few inquiries involving round lots in the market, and business has been limited to moderate quantities for prompt shipment in most cases. It is evident that foreign buyers covered their more pressing wants during the heavy buying movement of the last half of April, and that they are now staying out of the market to test out the higher-price basis which refiners have established on a number of grades.

Wax Advance Halts

Conditions in the paraffin wax market indicate that there is an active speculative interest operating, and that the situation is now at a point where the upward movement on scale will have to stop unless fully refined starts toward higher levels.

There is believed to be a fairly "long" interest in the market at present, and scale is in short supply and held at prices entirely out of line with the refined grades in a number of instances. Demand for all grades has slowed down, buyers waiting for some sign as to how far the market may be expected to go on the present move.

Refiners have adopted definitely stronger views on prompt and near-by wax. Some refiners who sold March-April-May production at prices one-half to five-eighths cent a pound under the present banis are refusing to entertain bids based on today's market for their June output, and are withholding all offerings in anticipation of further advances. This has naturally made for a slowing down in jobbing operations on the spot position. Export buyers have been in the market in a moderate way during the week, with refined grades getting the call. Quite a little wax has been sold here this week for shipment out of New Orleans, but sales out of spot stocks are not so large.

Refinery holdings of paraffin wax are smaller than at the start of the year, and appreciably lower than stocks on hand at this time last year.

Petrolatum

Prices for petrolatum have held at the levels established two weeks ago. Business has picked up a little this week, but the volume is still rather light, and there is not sufficient buying being done to enable refiners to realize any better prices on their offerings. There has been a little export inquiry for dark green, with buyers bidding 1⅞ cents a pound, and refiners quoting 2 cents. Amber has also sold in a small way for export, with refiners quoting in car lots at 3¼ cents a pound, extra amber being listed at one-half cent over this figure. Buying from the domestic trade has been somewhat better, with cream well held at 6⅜ cents a pound, lily white at 8 cents, and snow white at 8½ cents. Domestic consumers are not believed to be carrying much petrolatum at their plants, however, and refiners look for better things in the market in the near future. They point out that buying since practically the start of the year has been of the hand-to-mouth variety, and add that consumers will surely be in need of larger quantities of petrolatum within the next several weeks to take care of the seasonably heavy demand for the product which is just getting under way. Under these conditions, refiners are refraining from forcing stocks on the market at price concessions, and waiting for things to pick up.

Export Trade Lags

Export buyers have been slow to reenter the market for gasoline and kerosene. April 30 saw the last of the monthly deliveries of these products to export terminals at the low prices which prevailed at the start of last month, and it is but natural that business should be slow to resume, particularly in view of the higher prices now in effect.

No inquiries for gasoline cargoes are reported this week, the recent stiffening in prices both at the Gulf and East Coast markets apparently having put a damper on demand. Export buyers are quoted as declaring that they wish to thoroughly test out the present price basis, and with this object in view, a few tentative gasoline inquiries are reported to have been put out at an eighth to a quarter cent under the market. Thus far the efforts of foreign buyers to precipitate a break in export prices have not met with success, and while it is conceded that a reaction of an eighth of a cent might be a natural follow-up of the recent upward swing in prices, there are no indications yet that refiners are in any mood to grant concessions. On the contrary, sellers in the majority of cases seem to be thoroughly "sold" on the idea of a still higher market. Some of the large companies recently bought up fairly heavy stocks of gasoline to fill their export orders, and some of the smaller refiners who might normally have a little surplus gasoline to sell at concessions at such a time were cleaned out of reserve stocks by the buying of the larger companies.

Gasoline for export is unchanged at 10 cents for navy in bulk and 25.40 cents in cases, with bulk naphthas 10½ cents for 61-63 degrees, 11 cents for 64-66 degrees, and 14 cents for 66-68 degrees.

Further increase in refinery prices for kerosene would seem to effectively bar any reductions in export prices on this oil. Export buyers, however, believe that the current strength is but a temporary condition and that lower prices may reasonably be anticipated by the closing half of the month.

Export demand for other refined products has been along routine lines during the week, with no trading in large lots reported.

Principal Exports

The following table shows principal exports of petroleum and refined petroleum products from New York during the past three weeks (all figures in gallons unless otherwise noted):

	Week Ended		
	Apr. 27	Apr. 20	Apr. 13
Gasoline	1,138,250	1,710,961	277,800
Kerosene	1,063,000	1,179,000	1,846,400
Naphtha	140,500	3,946,800	4,886,000
Fuel oil	2,172,084	149,300	.....
Lubricating oil	1,388,450	1,499,000	2,316,700
Petroleum (ref'd)	476,980	2,285,500	3,643,340
	Pounds		
Petrolatum	46,643	125,500	40,500
Paraffin wax	834,800	1,166,700	1,045,300
Refined	29,500	.....	691,900
Scale	1,243,800	676,900	1,649,500

Included in the kerosene exports was a shipment of 450,000 gallons on the steamer Dalworth for Victoria. The same steamer carried 210,000 gallons for Rio Grande. The steamer Thode Fagelund carried 140,000 gallons of kerosene for Rio de Janeiro.

The largest shipment of fuel oil from New York for some time went out on the Inverarden for Southampton, the cargo comprising 2,087,434 gallons.

Some of the larger export shipments of lubricating oil were as follows: 105,060 gallons on the Rudolf Albrecht for Copenhagen; 72,595 gallons on the Sandown Castle for Lourenco Marques, and 51,294 gallons on the Guido for Manchester.

Included in the paraffin wax exports during the week were 180,590 pounds on the Cristobol Colon for Gijon; 178,676 pounds on the Aconcagua for Valparaiso; 215,269 pounds on the Tokoaka Maru for Kobe; 243,364 pounds on the Caronia for Liverpool; and 318,570 pounds on the Stockholm for Gothenburg.

Tanker Market

Chartering operators report a good demand for clean tankers for moving California gasoline eastward, and the market is firming up, due to a shortage of tanker tonnage in the intercoastal trade. The California rate on clean tankers is out of proportion to Gulf Coast charter rates on dirty tonnage, and shows of signs of widening the spread still farther. Much of the tonnage formerly in the intercoastal trade has been diverted to other runs, following the sharp falling off in the movement of California petroleum eastward during the past year. Should the gasoline market on the East Coast continue its improvement, it is probable that charters for intercoastal shipments will become more active, but at present the rate on shipments is too high to permit of a heavy movement.

There has been a dull market for tanker charters in other runs and rates are hovering around the low figure for the year. Clean tankers have been in best demand, with the market steady, but on dirty tonnage the supply seems to exceed the demand. One reason for this is that the principal East Coast refiners have built up their own tanker fleets where they are adequate to take care of the normal movement of oil to East Coast refinery terminals, this naturally making for a dull market on coastal transportation. A falling off in European demand for gasoline and other refined products during the past fortnight has also been a weakening factor in the charter market and has increased the amount of idle tonnage.

California Oil Receipts

Receipts of California crude and refined oils at Atlantic and Gulf Coast ports for the week ended April 28 totaled 245,000 bbls., a daily average of 35,000 bbls., against 706,000 bbls., a daily average of 100,857 bbls. for the week ended April 21, and a daily average of 62,357 bbls. for the four weeks ended April 28.

	Week End. Apr. 28
At Atlantic Coast Ports—	
Baltimore	.....
Boston	75,000
New York	90,000
Philadelphia	80,000
Others	.....
Total	245,000
Daily averages	35,000
At Gulf Coast ports	.....
Daily averages	.....
Total Atlantic, Gulf Coast ports	245,000
Daily averages	35,000
Daily averages 4 weeks ended	62,357

Distribution of California oil receipts is as follows:

Crude	90,000
Gasoline	155,000
Gas oil	.....
Total	245,000

Imports of Petroleum

Imports of crude and refined oils at the principal United States ports for the week ended April 28 totaled 1,332,000 bbls., a daily average of 190,286 bbls., compared with 2,146,000 bbls., a daily average of 306,571 bbls. for the week ended April 21 and a daily average of 234,500 bbls. for the four weeks ended April 28.

	Week End. Apr. 28
At Atlantic Coast Ports—	
Baltimore	.....
Boston	.....
New York	832,000
Philadelphia	125,000
Others	80,000
Total	1,037,000
Daily averages	148,143
At Gulf Coast Ports—	
Galveston district	.....
New Orleans and Baton Rouge	230,000
Port Arthur and Sabine district	65,000
Tampa	.....
Total	295,000
Daily averages	42,143
At all United States ports—	
Total	1,332,000
Daily averages	190,286
Daily average 4 weeks ended	242,429

GASOLINE CONSUMPTION HEAVY IN PENNSYLVANIA

OIL CITY, Pa., May 4.—Another week of improvement was recorded in the Pennsylvania refined situation and with fine motoring weather prevailing all over the Pennsylvania marketing territory the refiners are looking forward to a continued improvement. The gasoline situation was much improved during the week. The price is stronger and the demand and consumption are both excellent. Many cars which were in winter storage are now on the road again and longer trips are being taken by city residents with a greater use of motor fuel.

Kerosene also improved. The price advanced some and demand was fine. The plowing season is now on in earnest and the tractors are drawing heavily on stocks held by refineries in this territory.

Fuel oil was unchanged. Cylinder stocks were little changed, but if anything for the better. Wax was strong and demand was good. The refineries in the Pennsylvania district are heavily sold on wax. The demand for neutrals was good and the prices a trifle stronger. Bright stocks were improved.

Brief Items for Petroleum Refiners

HEAVIER CRUDES FIND READY DEMAND IN EAST

NEW YORK, May 5.—The heavy influx of West Texas and Venezuelan crude is permitting East Coast refiners to take in large stocks of exceptionally cheap crude oil, and consequently, allows a much better margin of profit on the refined products. Atlantic Refining Co. has been a large taker of West Texas crude and has found it so satisfactory that it is now supplying its interior refineries with this oil. The recent action of the company in arranging to ship West Texas crude from its Philadelphia terminal to its refineries in Franklin and Pittsburgh was one of the most revolutionary in the history of the petroleum industry, in as much as it reversed the pipe line movement of crude for the first time in the history of the Eastern oil trade. West Texas oil is now being moved by tanker to the Atlantic Refining Co.'s Philadelphia terminal, and thence moved to the interior by pipe line. Much of the oil so handled represents the company's own production, while large quantities are also being purchased in the open market.

While the gasoline content of West Texas crude, which averages 26 per cent, is much smaller than that of Mid-Continent oil, the exceptionally low prices at which West Texas production can be bought has made this oil a prime favorite with East Coast refiners. Standard Oil Co. of New Jersey is handling 50,000 bbls. daily, supplied through Humble Oil & Refining, a subsidiary, by tanker from Corpus Christi. Shell Union Oil Co. is reported taking 20,000 bbls. a day, part of which is moving by tank car to its St. Louis and Chicago refineries. With the early completion of additional pipe line facilities for handling production in West Texas, it is expected that these quantities will be increased. With Winkler County producing more than 200,000 bbls. daily out of estimated potential production of a minimum of 350,000 bbls. a day, there is plenty of West Texas oil available.

PAMPA PLANT TO START OPERATING THIS MONTH

AMARILLO, Tex., May 5—The Pampa Refining Co. expects to make an initial run at its new skimming plant located at Pampa, Tex., within the next 10 days. The capacity of the plant is 4,000 bbls. daily.

The plant has been built in less than 60 days. One unique feature lies in the fact that it has complete electrical equipment, no steam being used in the operation. The plant will operate with crude oil obtained from the Gray County fields. The products will be distributed locally so far as possible and the balance will be shipped to northern markets.

The plant is owned by Reese Allen and associates. The same interests have operated the Amarillo Refining Co. for several years.

JENSEN WITH ACME

CHICAGO, May 5.—E. E. Jensen has assumed charge of the light oil department of the Acme Petroleum Co. of this city. Previously, Mr. Jensen was with the Independent Oil Men of America in charge of its division of Red Hat motor oils. Before going with the I.O.M.A., he was with the Pierce Petroleum Co. in its lubricating sales division. Mr. Jensen plans that in addition to the management of the light oils for the Acme Petroleum Co., he will devote considerable time and effort to building up its department of lubricating oils.

INSTALL CRACKING UNITS

Cracking units of the Jenkins type are being installed at the refineries of the Tri-State Refining Co., Kenova, W. Va.; Western Oil Corp., Los Angeles, and the Motor Fuel Products Co., Laredo, Tex. The cracking units being installed each have a capacity of 1,500 bbls. daily.

The California installation is specially designed to operate with fuel oil. The Western Oil & Refining Co., an affiliated company of the Western Oil Corp., has had a unit in operation for some time.

HUMBLE ASKS LOWER RATES FOR BAYTOWN

HOUSTON, Tex., May 5.—Humble Oil & Refining Co. has filed a complaint with the Interstate Commerce Commission at Washington asking that coastwise and export rates out of Baytown be equalized with those of Galveston, Beaumont, Port Arthur and other shipping points. Baytown is the location of the company's refinery on the Houston ship channel, about 30 miles southeast of Houston.

The Humble petition also asks that the commission delay a final decision in a similar complaint filed by The Texas Company at Port Arthur and issue an order covering both issues. The Texas Company's complaint asked that Port Arthur export and coastwise rates be equalized with those of Houston, Galveston and Texas City. Examiner Jameson already has reported to the commission in The Texas Company's complaint that the complaint be dismissed.

SEEK REOPENING

WASHINGTON, D. C., May 7.—The Department of Justice has made application in the Federal District Court of Northern Illinois seeking to have the antitrust suit against Standard Oil Co. of Indiana, The Texas Corporation and 48 other companies reopened before the special master. The special master after taking of testimony several months ago recommended that the suit be dismissed for want of equity.

The Government now contends that the master's report is not adequate to enable the court to make a final determination of the case. The case involves the pooling of patents by several companies in the development of cracking processes.

AIR LIFT IN COLE FIELD

HOUSTON, Tex., May 7.—The first air-gas lift plant in the Cole Field of Duval County, southwest Texas, is being installed by the Cole Petroleum Co. This unit will consist of a 170-horsepower engine. Air will be used as a lifting medium at first due to the declining gas volume. The Cole Petroleum Co., holder of the bulk of the field, will place six or seven wells on the lift at the start, replacing pumps which have been producing from 100 to 300 bbls. per well. This field originally produced gas only from a sand around 2,700 feet but recently a number of small pumping wells have been completed and gas volume and pressure have declined materially.

SHIMEALL SUPERINTENDENT

K. W. Shimeall, formerly superintendent of the Glenrock, Wyo., refinery of the Continental Oil Co., is now in charge of the Sapulpa, Okla., refinery of the same company. Mr. Shimeall succeeds M. S. Beringer, who had been superintendent for the past two years. Mr. Beringer resigned and will represent an American manufacturer of refinery equipment in Rumania.

SCOTT OPENS OFFICES

CHICAGO, May 5.—H. A. Scott, who recently resigned his connection with the Acme Petroleum Co., has opened offices at 30 North Wabash Avenue. He has secured the representation for this territory of the Willock Oil Co. of Pittsburgh, Pa., and plans to represent several Oklahoma refiners here. Previous to joining the staff of the Acme Petroleum Co., Mr. Scott was the representative of the Imperial Oil Co. at Pittsburgh.

REFINERY CREDIT LOSS UNUSUALLY LOW IN 1927

Credit losses in the petroleum refining industry are low compared to those of other industries, according to a report compiled by E. B. Moran, secretary-manager of the Petroleum Refiners Division of the National Association of Credit Men. The bad debt loss in 1927 based on reports from 52 of the principal refiners in the United States was 18½ cents per $100 sales. This was a small increase over the 17⅓ cents per $100 which was the average loss in 1926. In 1925, the average loss was 19 cents.

The losses, according to reports ranged from 75 cents per $100 sales down to zero. Six of the 52 refiners had no credit losses.

"The average of 18½ cents per $100 sales," said Mr. Moran, "is unusually low, especially in view of the condition that has prevailed in the oil industry with reference to overproduction."

The 52 refiners whose credit experience furnished the average are scattered over the United States, although a majority are in the Mid-Continent Field. The credit department representatives and treasurers of the Refiners Division, National Association of Credit Men, will meet in convention in Chicago, September 4, 5 and 6.

SLIGHT INCREASE IN REFINERY EMPLOYMENT

For the first time in many months the March report of the Bureau of Labor Statistics shows a slight increase in employment at refineries. The trend during the past year has been downward, a reflection of adverse market conditions which has necessitated the operation of refineries with a minimum of labor.

Based on reports from 57 plants, there were 44,524 men on the pay rolls during one week in March, an increase of .2 per cent over the average for February. The amount of the pay roll, however, was less in March than in February by .1 per cent.

Compared to March, 1927, there was decided decrease in both the number of people on the pay rolls and the amount of the pay roll. In the number of employes the decrease was 18.5 per cent and 19.5 per cent in the total pay roll.

Although the decrease in the pay rolls can be largely accounted as being due to the effort of managers to reduce operating costs, it is also true that fewer men are required to operate plants. The perfection of modern equipment, including the varied types of automatic controls, has materially reduced the number of men required at many refineries.

NEW GASOLINE PLANT

The Ward Gasoline Co., of Breckenridge, Tex., expects to have its new gasoline plant in operation by June 1. The plant, which is located northwest of Breckenridge, will have a capacity of 3,000,000 to 5,000,000 cubic feet of gas daily taken from the leases of Pace & Ward. The residue gas from the plant will be sold to the Texas Carbon Industries.

SELL OREGON CRUDE TO INTERNATIONAL PLANT

DENVER, Colo., May 5.—Reports that the Cody Petroleum Co. had closed a deal for the sale of its Oregon Basin crude were confirmed here this week It is understood the contract price is 53 cents per barrel and that the oil will be shipped through the Illinois Pipe Line Co.'s line to Cody and then by rail to the International Refining Co.'s plant at Sunburst, Mont. The International, which has a charging capacity of 8 000 bbls. a day, is owned by the California Petroleum Co., which is controlled by The Texas Corporation. The contract is subject to approval of the Department of the Interior, but it is not anticipated there will be any objection as the price is about double the figure at which the department is said recently to have opposed the sale of the oil.

The Oregon Basin crude has a sulphur content of around 3 per cent, but the International also has been handling Sunburst crude oil which also has a high sulphur content. It is understood none of the other operators have made any contracts for the sale of the oil. The Ohio Oil Co., one of the largest operators in the field, has not been marketing its oil as it claimed not to have been able to find a satisfactory market and its wells are shut in after being completed. The best producer is the Cody Petroleum Co.'s No. 1 Klindt, which is making 630 bbls. a day.

AMERICAN REFINING CO. SOLD AT RECEIVER'S SALE

WICHITA FALLS, Tex., May 5.—At a receivers sale held here today all the corporate assets of the American Refining Co. were sold to creditors on their bid of $2,250,000. The properties of the company which have been operated by receivers during the past year consist of crude oil production, pipe lines, undeveloped leases, a local 8,000-bbl. refinery and marketing facilities. It is one of the largest independent oil companies in the North Texas area.

The creditors committee which made the bid consists of Frank Kell, Wichita Falls; Fred W. Catterall, Galveston; L. G. Hawkins, Vernon; F. F. Florence, Dallas, and J. C. Doheny, Kansas City, Mo. The bid will be submitted by the receivers to Judge William H. Atwell for confirmation in the Federal Court at Dallas on May 15. The receivers of the company are J. C. Mytinger and E. H. Eddleman of Wichita Falls, and John W. Hooser of Dallas. Should the sale be confirmed by the court the creditors will either operate the properties or make arrangements to sell the properties to satisfy the creditors.

FIVE MEN KILLED

Five men have died as a result of the explosion of an experimental still at the Muskogee, Okla., refinery of the Pure Oil Co. on April 27. The men who were killed instantly or who have died from injuries are R T. Tucker, resident chemist; James Lyons, Jr., assistant mechanical engineer; A. W. Hutchins, assistant distillation engineer; George Eaton, shell still foreman, and O. L. Loving, labor foreman. These men were fatally burned when a small experimental still exploded. The exact cause of the explosion has not been determined.

SKELLY BUYS STATIONS

WATERLOO, Iowa, May 5.—The Indland Oil Co. of this city has sold its string of stations to the Skelly Oil Co. The new purchasers plan to continue the business.

INCREASE IN USE OF GAS FOR OIL RECOVERY

(Continued from Page 41)

er ultimate yield. In general it may be stated that the rate of production from an oil producing formation is inversely proportional to the rate at which the pressure in it is dissipated. This, of course, is where existing pressures are due to gas and not occasioned by natural water drives.

If the large volumes of gas produced during the flush life of important pools are used for the purpose of manufacturing gasoline, an overproduction of this commodity may exist with a resultant low price. In many instances the price is so low and the life of the field so short the initial investment cannot be paid out.

In certain areas it has been shown that the oil producer can earn much greater profits by returning "wet gas" to the producing formation than is possible by selling his gas to gasoline plants and obtaining extra revenue from royalty on the gasoline produced and sold. The value of the "wet gas" recycled through the formation may be as much as 300 per cent more than the value of his interest in the gasoline it would produce.

When oil has been produced down to the economic limit gas can then be used for gasoline and upon a continued recycling program more than the usual normal amount of gasoline can be recovered. The gasoline produced will also be more stable and of a better quality. Gasoline plants installed at this time can be properly designed as to size and a minimum amount of equipment used. Plants installed under this program will yield greater returns on capital invested.

Compressor Plants

Where compressor plants are installed to return gas to the formation in the early life of a field they should be designed so that they can be used in connection with gasoline absorption plants with a minimum change in equipment. After recycling for gasoline extraction the same plants can be used for booster stations to market gas remaining. Vacuum should never be applied to any property until all the oil possible has been removed and it should only be used to produce gas.

Results of tests conducted for the past two years show that gasoline vapors carried by wet gas offer the greatest possible scrubbing action for removing oil from sand grains in a producing formation. With such a scrubbing action greater recoveries will be made and the gasoline used for this purpose will be recovered with the oil as an increase in gravity.

If large quantities of gas associated with oil are sold for industrial purposes during the early life of the field, much of the oil will be robbed of its gas and will consequently be made dormant where it cannot be produced. It is true that the gas thus produced has a definite market value. It will also have the same, or an even greater market value if it is used first for oil recovery, next for gasoline recovery and finally for industrial consumption as fuel. Gas is always cheapest at the start of a pool when there is most available. To use it for reinjection at this time is most economical as its cost for this purpose at a later date makes it prohibitive to use.

Nature was kind enough to give us a large amount of potential energy stored up in the gas. To produce this gas without utilizing this energy is to waste a resource that cannot be replaced. This waste will be paid for by leaving oil in the ground that might otherwise be recovered.

Method of Production

Experiments conducted on the best method under which to produce a well show that in order to minimize the gas waste, the oil should not be taken from the well at a rate greater than it can enter the well bore from the formation. To do so will create an oil-drained space around the well which will permit gas to escape freely. This gas in escaping will not expend its energy on moving more oil to the hole and will cause a rapid decline in pressure. To prevent the by-passing of gas in a well the formation must be kept saturated with oil at all times. If gas is being returned to the formation under pressure from the surface, it is necessary to prevent it from by-passing or channeling through from well to well. The best method to be followed in doing this depends upon the manner in which the well is being produced. In general, wells may be classed in three groups.

1. Natural flowing wells.
2. Artificially flowed wells.
3. Pumped or swabbed wells.

To obtain the greatest production with the least waste, a natural flowing well should not be permitted to flow at a rate which will use gas in abnormal amounts. The best means of controlling such a well is to hold back pressure on the formation which reduces the flowing differential pressure between the well bore and the sand back from the well. This may be accomplished by restricting the flow at the well head with a valve or "bean" or by running in a string of tubing in the well, or both. Better results will generally be obtained if the well is tubed and then controlled with a choke or "bean." Adjustable "flow-beans" have been found most desirable and they are used extensively. It is necessary to test each well in order to determine the most efficient point at which it should be operated. In most cases it will be found that the most efficient rate of flow is not the one which will permit a natural flowing well to produce at its greatest rate.

Where gas is taken from traps, used in connection with natural flowing wells, for gasoline extraction and then sold as residue a more stable supply will be provided for a longer period when the well is produced under pressure control.

Gas Lift Wells

A well produced by the gas lift can be operated in two ways:

One is to get the most oil possible in the least time; the other is to subsidize natural conditions and produce under pressure control for the greatest economical gain, making use of available gas to assist where natural energy is insufficient to make the well flow.

Unfortunately the first method is the one that has been most used with but little regard to the economic effect it would have on the crude oil market. The result has been a large overproduction, the cause of large investments in gasoline plant equipment which soon becomes inoperative, and whose pay-out status becomes doubtful. This method of operation also throws large volumes of gas on the market during development periods when it has but little value. In many cases millions of cubic feet are allowed to escape to the atmosphere daily, thereby creating a waste which can never be replaced.

Operations such as these have caused the gas lift to be looked on with no little disfavor. The gas lift when properly installed and handled affords one of the best known means of controlling energy loss and prolonging the active life of a well.

Experiments have been conducted where gas is being forced into certain wells where surrounding wells are being produced by the gas lift. The gas leaving the formation with the oil is being recycled through the wells and there is practically no loss of gas occurring. Results of these tests indicate that in certain areas it is most economical to recycle "wet" gas instead of extracting the gasoline. An increased gravity oil is produced in so doing.

Pumping Wells

Where a field is being repressured and producing wells are being pumped it is necessary at all times to maintain definite fluid levels in the wells. This can be done by adjusting the speed, stroke and size of pump, also by the location of the working barrel. Where wells are operated from a central power rod line multipliers will be found advantageous. It is extremely desirable never to operate so that the face of the producing formation is uncovered.

Activating Normally Depleted Formations

There are a great many areas where the entire gas volume associated with oil has been dissipated before normal production has been recovered. Later on, air has been used for stimulating recovery on account of gas shortage. In nearly all cases the injection of air has been advantageous as far as production is concerned, but there have been many cases where corrosion due to its use has been so bad that its use has been found prohibitive. The use of natural gas during the early life of such operations would have yielded greater returns from oil and gasoline and would have afforded sufficient gas to recover the greatest amount of production, all of which would have been reflected in the earning on capital invested.

Another use of gas in the field is the prevention of its escape from run, stock and storage tanks in the field. Where several tanks are used in a battery or in a tank farm they can be manifolded with a common breather system so that gas escaping from a tank that is filling will pass into one that is being emptied, thereby eliminating the breathing in of air. When air is excluded the evaporation loss is reduced to a minimum and the corrosion where sour oils are handled is reduced to a minimum and the danger of tank explosions is greatly reduced. The use of balloon breather bags attached to the manifold has also been found very economical to compensate for breathing losses occasioned by atmospheric temperature changes.

Oil will retain its gravity when kept in storage equipped as described and the complete installation cost of the extra equipment will generally be paid for in less than a year after put in operation, after which it will show a good return in savings.

Concluding, it can be stated that to get the greatest return from money invested in oil production, the utmost attention should be directed towards utilizing the total amount of potential energy contained in the gas and after this is done find a suitable use for it so that its calorific energy can be efficiently used. Casinghead and residue gas should be used whenever it can supplant natural gas that can be shut in.

NATURAL GAS MEN OUT IN LARGE NUMBERS

(Continued from Page 37)

tives of both the natural and manufactured gas interests. Every section of the association now has natural gas men on the managing committees."

Industry's Great Expansion

The great expansion being enjoyed by the natural gas industry was evident in the discussions among the gas company executives gathered here. The building of a big pipe line from the Monroe gas fields in Louisiana to St. Louis, tieing in with lines to Memphis and other cities, was discussed as were other important projects under consideration. More natural gas pipe lines have been built during the past year, probably, than during any other similar period in the history of the industry and as many more are contemplated with good chances of their being put through.

Numerous cities are active in efforts to procure the convention of the association next year. It is realized the Southwest is the center of the natural gas business in the United States and a strong movement is on foot to bring the convention to this area again next year. It seems to have been the policy in the past, however, to alternate east and west, which would indicate those pulling for the next meeting to be held back East might have the best chance.

The gas men suggested, however, that as The Oil and Gas Journal had purchased a lot of additional property in Tulsa this publication might bring the convention next year to Tulsa and care for it in its new building. I told them if they felt that way to come ahead, we would provide the building although our present quarters is and has been the mecca of all natural gas men coming to the Southwest who wanted to get started off on the right foot.

DALLAS CONVENTION HAS SPECIAL SIGNIFICANCE

(Continued from Page 37)

ily into the spirit and purpose of the work and are contributing valuable information and enthusiasm to the common cause.

In the Southwest we have the factor of distance. This, to a considerable extent, prevents attendance at committee meetings held in Eastern or Middle Western cities. To bridge this gap we suggest development of the work of the Southwest Division of the Natural Gas Department. This division can have its own committees considering those problems particularly applicable to this section, making their reports thereon at the annual or semiannual conventions. Certain of these committees might tie in advantageously with the general or sectional committees of the American Gas Association through some form of liaison. In this way we can help each other. The secretary of the Natural Gas Department and the secretary of the Southwest division should have the responsibility of coordinating these forces and of keeping them engaged without duplication of labors, for the benefit of the entire industry.

The merging of the two great industries presented, naturally, many little problems and adjustments that had to be worked out. To the devoted interest and unselfish spirit of the chairman of your department, N. C. McGowen, we owe the fact that they were disposed of expeditiously, with absolute impartiality, and with the best interests of the industry always the first consideration. The value of his services in this regard can not be estimated although they will have an enduring record of a large task splendidly performed.

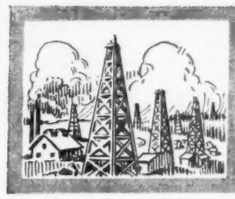
I need not remind you that the association has another convention this year, to be held in Atlantic City in October. We are hoping very earnestly that the natural gas men will be strongly represented, for although this may be thought of as their particular meeting, the October gathering is quite as much theirs, too. The manufactured and natural gas branches of our industry need to know each other's viewpoints, for that is, in my opinion, the direct path to the mutual understanding and definite co-operation by which the industry's achievements will be reached, and one of the most satisfactory means that I know of for learning those viewpoints is through the personal contact and association which attendance at these conventions affords.

CLEAVY JENKINS WINS OIL MEN'S MARATHON

Cleavy Jenkins led the runners in the marathon conducted last Sunday by Transcontinental Oil Co. employes, making the 39.6 miles from Tenth Street, Bristow, Okla., to South Boston Avenue and East Sixth Street, Tulsa, in 6 hours 27 minutes, and winning the first prize of $100. J. M. Hensen trailed him by 18 minutes 35 seconds, copping second money, $50. Thirty-nine contestants started in the race at 7:07 o'clock a. m. and 16 finished.

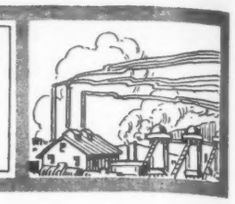
Ten cash prizes were hung up and besides this $200 worth of merchandise was distributed by merchants. The winners of cash prizes in addition to Jenkins and Hensen were: Paul Lawrence, $35; Frank Bollinger, $25; Fred Howard, $20; Ray Couch, $15; C. Newberry, $12.50; S. Rawden, $10; P. M. Hudson, $7.50; C. E. Bethel, $5.

O. L. Williams, car foreman at the Bristow plant, managed the race. The contestants were from departments of the Transcontinental company in Bristow, Boynton and Tulsa. Leaders in this race expect to enter a marathon for employes of various Mid-Continent oil companies.



REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.



GASOLINE AND NAPHTHA

OKLAHOMA (Group 3)—	May 8		May 1		Apr. 24	
50-52 450 endpoint	.06¾		.06½		.06¼	.06½
56-58 450 endpoint	.06¾		.06½		.06½	.06⅝
58 60 450 endpoint	.06¾	.06⅞	.06¾		.06⅝	
*58-60 437 endpoint (U. S. Motor)	.07106		.06940		.06851	
60-62 437 endpoint	.07200		.06944		.06798	
*60-62 400 endpoint	.07271		.07000		.07096	
*64-66 375 endpoint	.07437		.07214		.07250	
68-70 360 endpoint	.07½	.07¾	.07½	.07¾	.07½	
64-66 437 endpoint (blend)	.07	.07⅛	.07		.06¾	.07

*Weighted average prices May 7 as reported by representative refiners. Sales to jobbers only.

North Texas—						
56-58 450 endpoint	.06¾		.06½		.06⅝	.06½
58-60 450 endpoint	.06¾		.06½		.06½	
58-60 437 endpoint (U. S. Motor)	.07		.06¾	.06⅞	.06⅝	.06¾
60-62 400 endpoint	.07⅛	.07¼	.06⅞	.07	.06⅞	.07⅛
64-66 390 endpoint	.07¼	.07⅜	.07¼		.07	.07¼
64-66 375 endpoint	.07⅝	.07¾	.07½		.07¼	
68-70 360 endpoint	.07½		.07¼	.07½	.07¼	.07⅜
64-66 437 endpoint (blend)	.07		.06¾	.07	.06⅝	
NORTH LOUISIANA—						
58-60 437 endpoint (U. S. Motor)	.07½		.07¼		.07¼	
ARKANSAS—						
58-60 437 endpoint (U. S. Motor)	.07¼	.07½	.07	.07¼	.07	.07¼
PENNSYLVANIA—						
52-54 Naphtha	.08⅜	.09	.08⅜	.09	.08½	.08¾
54-56 Naphtha	.08¾	.09	.08¾	.09	.08½	.08¾
58-60 Gasoline	.09¼	.09½	.09¼	.09½	.08¾	.09
60 Gasoline	.09½	.09¾	.09½	.09¾	.09	.09¼
62 Gasoline	.09¾	.10	.09¾	.10	.09¼	.09½
64 Gasoline	.10	.10½	.10	.10½	.09½	.09¾
CALIFORNIA—						
58-60 437 endpoint (U. S. Motor) domestic	.10½	.11	.10½	.11	.10½	.11
CHICAGO DISTRICT (Based on Group 3)—						
50-52 450 endpoint (Naphtha)	.06¾		.06½	.06⅝	.06½	
56-58 450 endpoint	.06⅝	.06¾	.06½	.06⅝	.06½	
58-60 437 endpoint (U. S. Motor)	.07	.07⅛	.07		.06¾	.06⅞
60-62 400 endpoint	.07¼	.07⅜	.07⅛	.07¼	.07	.07⅛
64-66 375 endpoint	.07⅜	.07½	.07⅜	.07½	.07¼	.07⅜
68-70 360 endpoint	.07⅝	.07¾	.07½	.07⅝	.07½	
64-66 437 endpoint (blend)	.07	.07¼	.06⅞	.07	.06¾	.06⅞

NATURAL GASOLINE

OKLAHOMA (Group 3)—	May 8		May 1		Apr. 24	
Grade A, 72-79.9, 375 e.p., rec. 90%	.05½	.05¾	.06	.06¼	.06¼	.06⅜
Grade AA, 80-87.9, 375 e.p., rec. 90%	.05½	.05¾	.06	.06⅛	.06¼	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¼		.05¼		.05⅝	.05¾
Grade BB, 84-92, 375 e.p., rec. 85%	.05¼		.05¼		.05⅝	
Grade C, 80-92, 375 e.p., rec. 78%	.05		.05	.05⅛	.05	.05⅛
NORTH TEXAS—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.05½	.05⅝	.06	.06¼	.06¼	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.05½		.06	.06¼	.06¼	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¼	.05⅜	.05¼		.05¾	
Grade BB, 84-92, 375 e.p., rec. 85%	.05¼		.05¼		.05¾	
Grade C, 80-92, 375 e.p., rec. 78%	.05	.05⅛	.05		.05	
NORTH LOUISIANA—						
Grade AA, 80-87, 375 e.p., rec. 90%	.05¾		.06¼		.06½	
Grade BB, 84-92, 375 e.p., rec. 85%	.05½		.05½		.05⅞	.06
Grade C, 80-92, 375 e.p., rec. 78%	.05¼		.05⅝	.05¼	.05¼	.05⅜
CALIFORNIA—						
75-85, 375-390 endpoint	.08½	.09	.08½	.09	.08½	.09
CHICAGO DISTRICT (Based on Group 3)—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.05½	.05¾	.06	.06¼	.06¼	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.05½	.05⅝	.06		.06¼	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¼		.05¼		.05⅝	.05¾
Grade BB, 84-92, 375 e.p., rec. 85%	.05¼		.05¼		.05⅝	
Grade C, 80-90, 375 e.p., rec. 78%	.05		.05		.05	

BURNING OIL

OKLAHOMA (Group 3)—	May 8		May 1		Apr. 24	
41-43 water white Kerosene	.05¼	.05⅜	.05	.05⅛	.05	.05⅛
42-44 water white Kerosene	.05⅜	.05¾	.05¼	.05½	.05¼	.05½
NORTH LOUISIANA—						
41-43 prime White Kerosene	.05½		.05½		.05½	
NORTH TEXAS—						
41-43 water white Kerosene	.04⅞	.05	.04¾	.05	.04¾	.04⅞
40-42 water white Kerosene	.04⅝	.04¾	.04½	.04⅝	.04½	.04⅝
ARKANSAS—						
41-43 water white Kerosene	.05¼	.05⅜	.05¼		.05¼	
PENNSYLVANIA—						
43 Kerosene prime white	.06	.06¼	.06	.06¼	.06	.06¼
45 Kerosene water white	.06½	.06¾	.06½	.06¾	.06¼	.06½
46 Kerosene water white	.06¾	.06⅞	.06¾	.06⅞	.06¾	.07
47 Kerosene water white	.07	.07¼	.07	.07¼	.06¾	.07
300 Mineral Seal	.07	.07¼	.07	.07¼	.07	.07¼
CALIFORNIA—						
38-40 water white Kero. (high burning test)	.05½	.06	.05½	.06	.05½	.06
Engine distillate, 43-45 445 endpoint	.08	.08½	.08	.08½	.08	.08½
Engine distillate, 42-44 480 endpoint	.07	.08	.07	.08	.07½	.08
CHICAGO DISTRICT (Based on Group 3)—						
41-43 water white Kerosene	.05⅛	.05⅜	.05	.05¼	.05	.05¼
42-44 water white Kerosene	.05⅜	.05¾	.05⅜	.05½	.05⅜	.05½

FUEL OILS

OKLAHOMA (Group 3)—	May 8		May 1		Apr. 24	
Below 18 Fuel Oil, per bbl.	.70	.75	.72½	.75	.75	.80
18-22 Fuel Oil, per bbl.	.72½		.75		.80	.85
22-26 Fuel Oil, per bbl.	.75	.80	.80	.85	.82½	.85
24-26 Fuel Oil, per bbl.	.77½	.80	.82½		.85	
26-30 Fuel Oil, per bbl.	.80	.85	.85		.87½	.90
28-30 Fuel Oil, per bbl.	.85	.90	.90	.95	.92½	.95
32-36 Gas Oil (dark)	.02⅝		.02½	.02⅝	.02½	
32-36 Gas Oil (straw distillate)	.02⅞	.02¾	.02⅝		.02⅝	
36-38 Distillate	.03	.03⅛	.03		.03	
38-40 Straw Distillate	.03¼		.03	.03¼	.03	.03⅛
NORTH TEXAS—						
24-26 Fuel Oil (Sellers' cars) per bbl.	.70		.70	.75	.75	
32-36 Gas Oil (straw)	.02½		.02⅜		.02⅜	
38-40 Straw Distillate	.03	.03¼	.03		.03	
NORTH LOUISIANA—						
18-20 Fuel Oil, per bbl.	.85	.90	.85	.90	.85	.90
32-36 Gas Oil	.02⅞	.03	.02⅞	.03	.02⅞	.03
ARKANSAS—						
33-36 Distillate	.03½	.03¾	.03½	.03¾	.03½	.03¾
32-36 Gas Oil (straw)	.02¾	.03	.02¾	.03	.02¾	.03
16-22 Refinery Fuel Oil, per bbl.	.80	.85	.80	.85	.80	.85
GULF COAST (South Texas)—						
Gas Oil	.04¼		.04¼		.04¼	
Bunker C Fuel, per bbl.	1.15	1.20	1.15	1.20	1.15	
PENNSYLVANIA—						
30-34 Fuel Oil	.04¾	.05	.04¾	.05	.04¾	.05
36-40 Fuel Oil	.05	.05¼	.05	.05¼	.05	.05¼
CALIFORNIA—						
33-36 Distillate	.03½	.03¾	.03½	.03¾	.03½	.03¾
27-32 Distillate	.02½	.03	.02½	.03	.02½	.03
*15-20 Fuel Oil, Bunker (at tide water)	.85	1.00	.85	1.00	.85	1.00
15-20 Fuel Oil (cargo lots), per bbl.	.75	.85	.75	.85	.75	.85
27 plus Diesel, per bbl.	1.15	1.19	1.15	1.19	1.15	1.19
CHICAGO DISTRICT (Based on Group 3)—						
24-26 Fuel Oil (sellers' cars) Group 3, bbl.	.77½	.82½	.85	.90	.85	.90
22-26 Fuel Oil (sellers' cars) Group 3, bbl.	.75	.80	.82½	.85	.82½	.85
18-22 (Group 3), per bbl.	.72½	.75	.77½	.80	.77½	.80
16-20 Smackover, per bbl.	.85	.87½	.85	.90	.85	.90
32-36 Gas Oil (zero)	.02¾	.02⅞	.02¾	.03	.02¾	.03
32-36 Gas Oil (industrial)	.02⅝	.02¾	.02½	.02⅝	.02½	.02⅝
36-38 Distillate	.03		.03		.03	
38-40 Straw Distillate	.03⅛		.03	.03⅛	.03	.03⅛

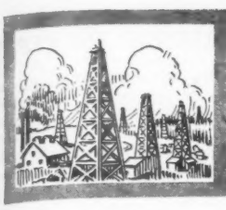
*Bunkers.

LUBRICATING OIL AND WAX

OKLAHOMA (Group 3)—	May 8		May 1		Apr. 24	
100 vis., 2 color, 20-25 cold test	.06¼	.06½	.06¼	.06½	.06¼	.06½
100 vis., 3 color, 20-25 cold test	.06	.06¼	.06	.06¼	.06	.06¼
150 vis., 3 color, 20-25 cold test	.08¼	.08½	.08¼	.08½	.08¼	.08½
150 vis., 4 color, 20-25 cold test	.08	.08¼	.08	.08¼	.08	.08¼
180 vis., 3 color, 23-28 cold test	.09⅜	.10	.09⅜	.10	.09⅜	.10
180 vis., 4 color, 23-28 cold test	.09¼	.09¾	.09¼	.09¾	.09¼	.09¾
180 vis., 5 color, 23-28 cold test	.09½	.09½	.09½	.09½	.09½	.09½
200 vis., 3 color, 23-28 cold test	.09½	.10½	.09½	.10½	.09½	.10½
200 vis., 4 color, 23-28 cold test	.09⅝	.10¼	.09⅝	.10¼	.09⅝	.10¼
200 vis., 5 color, 23-28 cold test	.09¼	.10	.09¼	.10	.09¼	.10
240 vis., 3 color, 25-30 cold test	.13¾	.14	.13¾	.14	.13¾	.14
240 vis., 4 color, 25-30 cold test	.13¼	.13½	.13¼	.13½	.13¼	.13½
240 vis., 5 color, 25-30 cold test	.12¼	.12½	.12¼	.12½	.12¼	.12½
280 vis., 3 color, 25-30 cold test	.15½	.16	.15½	.16	.15½	.16
280 vis., 4 color, 25-30 cold test	.15	.15½	.15	.15½	.15	.15½
280 vis., 5 color, 25-30 cold test	.14	.14½	.14	.14½	.14	.14½
Cylinder Stocks:						
600, steam refined, light green	.08	.09	.08	.09	.08	.09
600, steam refined, dark green	.06	.06½	.06	.06½	.06	.06½
190-200 vis. @ 210 Bright Stock	.28	.29	.28	.29	.28	.29
150-160 vis. @ 210 Bright Stock	.22	.24	.22	.24	.22	.24
Waxes:						
124-126 White Crude Scale Wax	.03½	.03⅝	.03½	.03⅝	.03¼	
PENNSYLVANIA—						
34 Neutral	.07½	.07¾	.07½	.07¾	.07½	.07¾
34 Sundebloom	.07¾	.08	.07¾	.08	.07¾	.08
36 Miners' Neutral	.06½	.06¾	.06½	.06¾	.06½	.06¾
150, 3 color	.27	.27½	.27	.27½	.27	.27½
180, 3 color	.31	.31½	.31	.31½	.31	.31½
200, 3 color	.33½	.34	.33½	.34	.33½	.34
220, 3 color	.34½	.35	.34½	.35	.34½	.35
600, steam refined	.09¼	.09½	.09¼	.09½	.09¼	.09¾
635, steam refined	.10¼	.10½	.10¼	.10½	.10¼	.10¾
650, steam refined	.11½	.12	.11	.11½	.11	.11½
600, Pennsylvania flash	.14	.15	.14	.15	.14	.15
*550, E filtered	.14½	.15	.14½	.15	.14½	.15
*600, E filtered	.15½	.15¾	.15½	.15¾	.15½	.15⅝
600, E filtered	.14¾	.15¼	.14¾	.15¼	.14¾	.15¼
600, D filtered	.22	.23	.22	.23	.22	.23
550, E filtered	.15½	.16	.15½	.16	.15½	.16
550, D filtered	.21½	.22	.21½	.22	.21½	.22
Pennsylvania Bright Stock	.28½	.29	.28½	.29	.28	.28¾
†122-124 White Crude Scale Wax	.04	.04½	.04	.04¼	.03⅝	.03½
†124-126 White Crude Scale Wax	.04	.04⅛	.04	.04⅛	.03⅜	.03½

*At Warren, Pa. †At New York.

GULF COAST (South Texas)—						
No. 2 color, 100 vis., pale oil	.07½	.08	.07½	.08	.07½	.08
No. 2 color, 200 vis., pale oil	.10	.11	.09½	.10	.09½	.10
No. 3 color, 300 vis., pale oil	.11½	.12	.11½	.12	.11½	.12
No. 3½ color, 500 vis., pale oil	.12	.13	.12	.13	.12	.13
No. 4 color, 750 vis., pale oil	.14½	.15½	.14	.15	.14	.15
No. 5 to 6 color, 200 vis., red oil	.08	.09	.07½	.08	.07½	.08
No. 5 to 6 color, 300 vis., red oil	.09	.10	.08½	.09	.08½	.09
No. 5 to 6 color, 500 vis., red oil	.10	.11	.10	.10½	.10	.10½
No. 5 to 6 color, 750 vis., red oil	.12½	.13	.12	.12½	.12	.12½
No. 2½ color, 200 vis., pale filtered	.11½	.12	.11½	.12	.11½	.12
No. 2½ color, 300 vis., pale filtered	.13½	.14	.13	.13½	.13	.13½
No. 2½ color, 500 vis., pale filtered	.15	.15½	.15	.15½	.15	.15½
No. 2½-3 color, 750 vis., pale filtered	.17½	.19	.17½	.19	.17½	.19
CALIFORNIA—						
130 vis., 2½-3 color	.09	.10	.09	.10	.09	.10
200 vis., 2½-3 color	.10	.10½	.10	.10½	.10	.10½
300 vis., 3-3½ color	.10½	.11	.10½	.11	.10½	.11
350 vis., 3½-4 color	.11	.12	.11	.12	.11	.12
400 vis . 3½-4 color	.13	.14	.13	.14	.13	.14
Red Neutral:						
200 vis., 4½-5 color	.08½	.09	.08½	.09	.08½	.09
300 vis., 5-6 color	.09	.10	.09	.10	.09	.10
400 vis., 5-6 color	.10½	.11	.10½	.11	.10½	.11



REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.

500 vis., 4½-5 color	.11½	.12	.11½	.12	.11½	.12
500 vis., 5-6½ color	.11	.11½	.11	.11½	.11	.11½
600 vis., 6 plus color	.12½	.13	.12½	.13	.12½	.13

Note: Bright Stocks are not manufactured commercially on the Pacific Coast.

NEW YORK (BAYONNE) REFINERY PRICES

	May 8	May 1	Apr. 24
†Gasoline, U. S. Motor, 58-60 437	.09¾	.09¾	.09½
Kerosene, water white, 41-43	.07½	.07½	.07½
*Fuel Oil, bunker "C," 14-16, per bbl.	1.25	1.35	1.35
*Fuel Oil, Diesel, 28-30, per bbl.	2.00	2.00	2.00
Gas Oil, 28 plus	.05¼	.05¼	.05¼
25 pale Paraffin Oil	.12	.12	.12
28 pale Paraffin Oil	.07	.07	.07
285 red Paraffin Oil	.11½	.11½	.11½
250 red Paraffin Oil	.10½	.10½	.10½
225 red Paraffin Oil	.09½	.09½	.09½
200 red Paraffin Oil	.09	.09	.09
Refined Wax:			
120-122 a.m.p., per lb.	.04	.03⅞	.03⅞
125-127 a.m.p., per lb.	.04¼	.04¼	.04¼
130-132 a.m.p., per lb.	.04¾	.04¾	.04½
135-137 a.m.p., per lb.	.06¼	.06¼	.06⅞
Petrolatum, in bbls., carload lots, per lb.:			
Dark Green	.02	.02	.02
Amber	.03¼	.03¼	.03¼
Extra amber	.03¾	.03¾	.03¾
Cream	.06⅜	.06⅜	.06⅜
Lily White	.08	.08	.08
Snow White	.08½	.08½	.08½

*Lighterage, 6.5c a barrel extra.

†Following are the correct quotations on this grade of gasoline for the respective dates and any previous quotations differing from these should be ignored. New York (Bayonne) refinery gasoline price 58-60 gravity U. S. Motor grade: April 17, 9¼ cents; April 10, 9¼ cents; April 3, 9 cents; March 27, 9 cents.

NEW YORK (BAYONNE) EXPORT PRICES

	May 8	May 1	Apr. 24
Gasoline, U. S. Motor, 58-60 437, in cases	.2540	.2540	.2540
Kerosene, standard white, in cases	.1740	.1740	.1740
Kerosene, water white, in cases	.1840	.1840	.1840
600, steam refined cylinder stock, in bbls.	.16¾	.16¾	.16¾
635, steam refined	.18	.18	.18
650, steam refined	.18½	.18½	.18½
600, Pennsylvania	.22	.22	.22
630, Pennsylvania flash	.34	.34	.34
600, Warren E	.24	.24	.24
800, Oil City E	.23	.23	.23
Light 135 Bright Stock	.37	.37	.36
Dark 135 Bright Stock	.34½	.34½	.34

LOS ANGELES EXPORT PRICES

	May 8		May 1		Apr. 24	
Kerosene, water white	.05	.05¼	.05	.05¼	.05	.05¼
U. S. Motor Gasoline, 53-55 437 e.p.	.07¼	.07½	.07¼	.07½	.07¼	.07½

CRUDE OIL PRICES

OKLAHOMA, KANSAS, NORTH AND EAST CENTRAL TEXAS

*Corsicana heavy (March 14, 1927) $1.00
Other fields ..... See gravity table

*Posted by Magnolia Petroleum Co.

TEXAS PANHANDLE
Carson and Hutchinson

Below 31 gravity	$ .60
31-31.9	.65
32-32.9	.70
33-33.9	.73
34-34.9	.76
35-35.9	.79
36-36.9	.82
37-37.9	.85
38-38.9	.88
39-39.9	.91
40-40.9	.94
41-41.9	.97
42-42.9	1.00
43-43.9	1.03
44 and above	1.06

Wheeler County

Below 30 gravity	$ .60
30-30.9	.65
31-31.9	.70
32-32.9	.75
33-33.9	.80
34-34.9	.83
35-35.9	.86
36-36.9	.89
37-37.9	.92
38-38.9	.95
39-39.9	.98
40-40.9	1.01
41-41.9	1.04
42-42.9	1.07
43-43.9	1.10
44 and above	1.13
Gray County	See gravity table

Humble Oil & Refining Co. Magnolia Petroleum Co. February 21.

†Iatan	Same as North Texas
Crane-Upton-Crockett	See gravity table
†Glasscock	$ .60
†Chalk	.80

*Includes Howard County and Westbrook Fields. Marland Refining Co. pays $1.05 for Howard County crude, effective May 21.
†Magnolia Petroleum Co., Jan. 14, 1928.

ARKANSAS-NORTH LOUISIANA

*Cotton Valley (Below 36 gravity April 11)	$ .75
Bellevue (Feb. 24, 1927)	1.20
Urania (Nov. 18, 1927)	.75
East El Dorado (March 16, 1927)	1.00
Other fields	See gravity table

*Cotton Valley crude above 36 gravity takes same gravity price schedule as shown for North Louisiana and Arkansas crude in Mid-Continent gravity price table.

Note—Cotton Valley and Bellevue, Standard Oil Co. of Louisiana, Louisiana Oil Refining Co., Gulf Refining Co. and Magnolia Petroleum Co.; (Magnolia Petroleum Co. posted Cotton Valley February 8); Urania, Louisiana Oil Refining Corp.; East El Dorado, Magnolia Petroleum Co., Gulf Refining Co.

GULF COAST

(Goose Creek, Hull, Liberty, West Columbia, Orange, Boling, Sour Lake, Humble, High Island, Pierce Junction and Spindletop.)

†Grade A (March 14)	$1.20
Grade B	See gravity table
*Jennings, La. (March 14)	$1.05
†Saratoga, Batson, Daytona (March 14, 1927)	$1.20
‡Markham (March 14)	1.00

*Gulf Pipe Line Co. †Sun Pipe Line Co. ‡Humble Oil & Refining Co. and other major buyers. §The Texas Company.

SOUTH CENTRAL AND SOUTHWESTERN TEXAS

*Luling (May 5)	$1.00
†Mirando (March 14)	1.00
Rockdale-Minerva (April 15):	
Below 38 gravity	1.25
38-39.9 gravity	1.27
39-39.9 gravity	1.29
40 and above	1.31
*Thrall	...
Callihan (May 15)	1.75
Lytton Springs (Lockhart)	See gravity table
Somerset	See gravity table

*Posted by Magnolia Petroleum Co. Thrall prices same as North Central Texas less 19¼ cents per cwt. freight.
†Magnolia Petroleum Co., Humble Oil & Refining Co., Crown Central Pipe Line Co.

ROCKY MOUNTAIN STATES
Ohio Oil Co.-Midwest Refining Co.
(Effective March 14)

Rock Creek, Wyo. (March 12)	$1.25
Salt Creek	See gravity table
Big Muddy (March 12)	$1.25

(Continued on Page 194)

CRUDE OIL GRAVITY TABLE

Gravity—	Okla., Kans., N. C. Tex. 1	No. La. and Arkansas 2	Smackover, Ark. 3	Stephens, Ark. 4	Gray County (Texas Panhandle) 5	Crane, Upton, Pecos, Crockett, Winkler Counties (West Texas) 6	Salt Creek, Wyo. 7	Grade B & Light Crude (G. Coast) 8	Somerset (South Central Texas) 9
24 and above	....	....	.90	....	....	....	....	....	....
Below 24	.76	....	.75	....	....	....	....	....	....
Below 25	....	....	....	....	....	....	....	1.16	....
24 to 24.9	.76	....	....	....	....	....	....	....	....
25 to 25.9	.81	....	....	....	....	....	....	....	....
Below 26	....	....	....	....	.60	.60	....	....	....
26 to 26.9	.86	....	....	....	.60	.60	....	1.19	....
27 to 27.9	.91	....	....	....	.65	.60	....	1.21	....
Below 28	....	.91	....	.85	....	....	....	....	....
28 to 28.9	.96	.96	....	.87	.70	.60	....	1.23	....
29 to 29.9	1.01	1.01	....	.89	.75	.60	1.01	1.25	....
30 to 30.9	1.06	1.06	....	.91	.80	.60	1.06	1.27	....
31 to 31.9	1.11	1.11	....	.93	.85	.60	1.11	1.29	....
32 to 32.9	1.16	1.16	....	.95	.90	.60	1.16	1.31	1.05
33 to 33.9	1.19	1.19	....	....	.93	.60	1.19	1.33	1.07
34 to 34.9	1.22	1.22	....	....	.96	.60	1.22	1.35	1.09
35 to 35.9	1.25	1.25	....	....	.99	.60	1.25	1.37	1.11
36 to 36.9	1.28	1.28	....	....	1.02	.60	1.28	....	1.13
37 to 37.9	1.31	1.31	....	....	1.05	....	1.31	....	1.15
38 to 38.9	1.34	1.34	....	....	1.08	....	....	....	1.17
39 to 39.9	1.37	1.37	....	....	1.11	....	....	....	....
40 to 40.9	1.40	1.40	....	....	1.14	....	....	....	....
41 to 41.9	1.43	1.43	....	....	1.17	....	....	....	....
42 to 42.9	1.46	1.46	....	....	1.20	....	....	....	....
43 to 43.9	1.49	1.49	....	....	1.23	....	....	....	....
44 to 44.9	1.52	1.52	....	....	1.26	....	....	....	....
45 to 45.9	1.55	1.55	....	....	....	....	....	....	....
46 to 46.9	1.58	1.58	....	....	....	....	....	....	....
47 to 47.9	1.61	1.61	....	....	....	....	....	....	....
48 to 48.9	1.64	1.64	....	....	....	....	....	....	....
49 to 49.9	1.67	1.67	....	....	....	....	....	....	....
50 to 50.9	1.70	1.70	....	....	....	....	....	....	....
51 to 51.9	1.73	1.73	....	....	....	....	....	....	....
52 and above	1.76	1.76	....	....	....	....	....	....	....

Column 1—Magnolia Petroleum Co. posted schedule February 21, 1928, making price below 30 gravity $.75 per barrel, 30-30.9 gravity $.90 and 31-31.9 gravity $1.05, with 3 cents increase per degree higher in gravity, taking 32-32.9 gravity at $1.16 as basis, with a top price of $1.76 for 52 and above.

Humble Oil Refining Co. posted $1.52 on all oil 44 gravity and above.

Oklahoma—Prairie Oil & Gas Co., Sinclair Oil & Gas Co., Gypsy Oil Co., Carter Oil Co., The Texas Company, February 21.

North Central Texas—[Including Ranger, Mexia, Powell, Richland, Wortham, Lytton Springs (Southwest Texas), Iatan and Panola (Magnolia) only. Iatan posted a flat price of $.93 by Magnolia on January 14, 1928). Currie, Nocona, Moran and Corsicana light]; Texas, Prairie, Sinclair and Gulf; The Texas Company, Humble Oil & Refining Co., February 21.

Kansas—Prairie, Sinclair; Carter, The Texas Company, February 21.

Column 2—Arkansas and North Louisiana—[Caddo, Bull Bayou, Crichton, De Soto, Haynesville, Homer and El Dorado only]; Standard Oil Co. of Louisiana, Texas Pipe Line Co., Louisiana Oil Refining Co., February 21 and Magnolia Petroleum Co., February 23.

Column 3—February 6, Louisiana Oil Refining Co. February 7, Standard Oil Co. of Louisiana, The Texas Company, Gulf Refining Co., Magnolia Petroleum Co. February 8, and Atlantic Production Co. February 10.

Column 4—Atlantic Oil Producing Co., Louisiana Oil Refining Corp., The Texas Company, February 22.

Column 5—Humble Oil & Refining Co., Magnolia Petroleum Co., February 21.

Column 6—Humble Oil & Refining Co., August 23; Marland Refining Co., Magnolia Petroleum Co., and Gulf Pipe Line Co., August 24.

Column 7—Midwest Refining Co., February 21. All crude over 37 gravity, $1.31 per barrel.

Column 8—Humble Oil & Refining Co. and other major buyers (schedule ends "35 and above"), March 14, with exception of Magnolia Petroleum Co., which stops at 31 degrees gravity. Sun Pipe Line Co. posted 2 cents differential for each degree above 35 gravity and $1.47 for 40 gravity and above.

Column 9—Grayburg Pipe Line Co. and Pioneer Oil & Refining Co., April 7.

CALIFORNIA CRUDE OIL PRICES

Standard Oil Co.-Union Oil Co. (Effective April 1, 1927)*

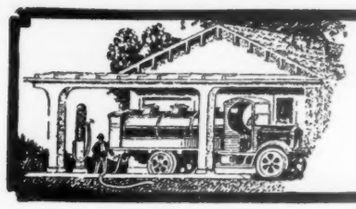
Gravity—	Fullerton, Brea, Long Beach, Huntington Beach, Richfield, Rosecrans-Dominguez, Torrance-Inglewood 1	Whittier, La Habra, Montebello 2	Kern River, Newhall-McKittrick, Midway-Sunset, Lost Hills, Belridge, Buena Vista Hills, Coyote 3	Santa Fe Springs 4	Coalinga 5	Wheeler Ridge 6	Santa Maria, Ventura, Orcutt, Salt Lake 7
14°	.85	.85	.75	.85	....	.75	.75	.85
15°	.85	.85	.75	.85	....	.75	.75	.85
16°	.85	.85	.75	.85	....	.75	.75	.85
17°	.85	.85	.76	.85	....	.75	.75	.85
18°	.85	.85	.75	.85	....	.75	.75	.85
19°	.85	.85	.75	.85	....	.75	.75	.85
20°	.85	.85	.77	.85	....	.76	.76	.85
21°	.86	.86	.79	.86	.85	.77	.77	.85
22°	.87	.86	.81	.87	.85	.78	.78	.85
23°	.88	.86	.83	.88	.85	.79	.79	.85
24°	.89	.85	.85	.89	.85	.80	.80	.85
25°	.90	.86	.87	.90	.86	.81	.81	.86
26°	.92	.87	.89	.91	.87	.82	.82	.87
27°	.94	.88	.91	.92	.88	.85	.82	.88
28°	.96	.89	.93	.93	.89	.87	....	.89
29°	.98	.90	.94	.94	.91	.89	....	.91
30°	1.00	.91	.99	.95	.93	.91	....	.93
31°	1.03	....	1.02	....	.95	.93	....	.95
32°	1.06	....	1.05	....	.97	.95	....	.97
33°	1.09	....	1.08	....	.99	.97	....	.99
34°	1.12	....	1.11	....	1.01	.99	....	1.01
35°	1.15	....	....	....	1.03	1.01	....	1.03
36°	1.18	....	....	....	1.06	....	....	1.06
37°	1.21	....	....	....	1.09	....	....	1.09
38°	1.24	....	....	....	1.12	....	....	1.12
39°	1.27	....	....	....	1.16	....	....	1.15
40°	1.30	....	....	....	....	....	....	....
41°	1.33	....	....	....	....	....	....	....
42°	1.36	....	....	....	....	....	....	....

*Column 1—Long Beach, Seal Beach and Huntington Beach crudes, 14 to 32 degrees, inclusive; Richland and Fullerton, 14 to 30 degrees; Torrance and Inglewood, 14 to 28 degrees; Domingues, 24 to 42 degrees. Rosecrans crude ranges from 14 to 42 degrees, but only Union Oil Co. posts below 24 degrees.

Column 2—Whittier crude, 14 to 22 degrees; Montebello, 14 to 30 degrees.

Column 3—Kern River, Newhall and McKittrick, 14 to 19 degrees; Midway-Sunset, Buena Vista and Elk Hills, 14 to 33 degrees; Lost Hills and Belridge, 14 to 34 degrees.

Column 8—Salt Lake, 14 to 19 degrees, inclusive; Santa Maria, 14 to 30 degrees; Ventura and Orcutt, 14 to 39 degrees. Posted by Union Oil Co.



TANK WAGON MARKETS

Tank wagon quotations for gasoline and kerosene in United States as furnished by the larger marketing concerns May 1.

ALL TANK WAGON AND SERVICE STATION QUOTATIONS INCLUDE TAXES

STANDARD OIL CO. (INDIANA)

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Chicago dist.	14.0	16.0	...	12.0
Decatur, Ill.	14.2	16.2	...	12.1
St. St. Louis	13.1	15.35	...	11.2
Joliet	14.4	16.4	...	12.3
Peoria	14.2	16.2	...	12.1
Quincy	14.2	16.2	...	11.9
Davenport, Ia.	17.5	19.5	3.0	12.3
Des Moines	17.5	19.5	3.0	12.3
Keokuk	17.5	19.5	3.0	12.3
Sioux City	17.1	19.1	3.0	11.9
Duluth, Minn.	17.5	19.5	3.0	12.9
Minneapolis	16.0	18.0	2.0	12.9
Mankato	14.1	16.1	2.0	12.7
La Crosse, Wis.	17.2	19.2	2.0	13.0
Milwaukee	16.1	18.1	2.0	11.9
Madison	16.3	18.3	3.0	12.1
Detroit, Mich.	17.8	19.8	3.0	13.7
Grand Rapids	17.7	19.7	3.0	13.6
Saginaw	17.9	19.9	3.0	13.8
Evansville, Ind.	17 4	19 4	3 0	13.4
Fort Wayne	17 4	19 4	3 0	13 4
Indianapolis	17.2	19.2	3.0	12.2
South Bend	17.4	19.4	3.0	13.4
Fargo, N. D.	18.9	20.9	2.0	14.9
Huron, S. D.	19.5	21.5	4.0	13.9
Sioux Falls	18.0	20.0	4.0	13.4
K. C., Mo.*	16.9	18.9	3.0	10.6
Springfield*	16.8	18.8	3.0	11.5
St. Louis*	15.6	17.9	2.5	11.3
St. Joseph*	16.5	18.5	3.0	11.2
Wichita, Kans.	14.8	16.8	2.0	10.8
Bartlesville, Ok.	15.5	17.5	3.0	10.5

NAPHTHAS

	Tank wagon	Tank car
Oleum spirits	14.7	9.5
V. M. & P. naphtha	16.2	11.0
Cleaner's naphtha	18.0	12.0
Stanisol	19.0	13.5

Tank wagon prices f.o.b. Chicago; tank car prices f.o.b. Whiting.

STANOLIND FURNACE OIL IN CHICAGO

Less than 100 gallons	9.0
100 to 799 gallons	8.0
800 or more gallons	7.5

Note—Outside Chicago furnace oil discount of 1 cent per gallon is given on deliveries of 100 to 249 gallons and 1½ cents on deliveries of 250 gallons or more.

Tank wagon prices of gasoline subject to discount of 1 cent a gallon on dumps of 50 gallons or more throughout territory except Chicago district. Kerosene subject to 1 cent discount on dumps of 50 gallons or more.

Outside the Chicago district, the following quantity discount schedule is in effect on monthly tank wagon deliveries of gasoline: 6,000 gallons or more, 1½ cents; 10,000 gallons or more, 2 cents; 15,000 gallons or more, 3 cents. These discounts include the 1 cent allowed on dumps of 50 gallons or more at one delivery.

Within the Chicago district, the following quantity discount schedule is in effect on tank wagon deliveries of gasoline. 750 to 2,000 gallons, one-half cent; 2,000 to 3,000 gallons, three-fourths cent; 3,000 to 6,000 gallons, 1 cent; 6,000 to 10,000 gallons, 1½ cents; 10,000 to 15,000 gallons, 2 cents; 15,000 gallons or more, 3 cents.

If the quantity bought during the year is equal to or exceeds 12 times the agreed monthly quantity, the discount is paid or credited on the entire quantity at the close of the term less the monthly payments made during the year.

*State tax 2 cents; remainder city tax.

OHIO

Standard Oil Co. (Ohio)

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
All Ohio points.	17.0	19.0	3.0	14.5

SOUTHWESTERN DISTRICT

Magnolia Petroleum Co.*

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Dallas, Tex.	14.0	18.0	3.0	11.0
Fort Worth	15.0	18.0	3.0	11.0
Houston	14.0	18.0	3.0	15.0
San Antonio	15.0	18.0	3.0	10.0
El Paso	17.0	20.0	3.0	16.0
Texarkana	16.5	20.5	3.0	12.0
Muskogee, Ok.	17.0	18.0	3.0	11.0
Okla. City	16.0	17.0	3.0	11.0
Tulsa	15.0	17.0	3.0	11.0
Ft. Smith, Ark.	18.0	20.0	5.0	12.0
Little Rock	20.0	22.0	5.0	12.0

*The following is the schedule of discounts on quantity gasoline sales adopted by the Magnolia Petroleum Co. in Oklahoma: Over 750 gallons a month, one-half cent; over 2,000 gallons, three-quarters cent; over 3,000 gallons, 1 cent; over 4,500 gallons, 1¼ cent; over 6,000 gallons, 1½ cents; over 9,000 gallons, 1¾ cents; over 10,000 gallons, 2 cents. If the quantity bought during the year is 12 times the monthly agreed purchases, the discount will be paid or credited on the entire quantity for the year less any monthly purchases.

The schedule on service station deliveries is: Over 200 gallons a month, 1 cent; over 300 gallons a month, 1¼ cents; over 400 gallons, 1½ cents; over 500 gallons a month, 1¾ cents; over 600 gallons, 2 cents. The same rule applies for annual purchases in the tank wagon discounts.

CENTRAL SOUTH DISTRICT

Standard Oil Co. (Louisiana)

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
N. Orleans, La.*	16.5	18.5	2.0	14.0
Baton Rouge	15.0	17.0	2.0	12.5
Alexandria	16.0	18.0	2.0	14.0
LaFayette	16 0	18 0	2 0	13 5
Lake Charles	16.5	18.5	2.0	14.0
Shreveport	16.5	18.5	2.0	13.0
Knoxv'le, Tenn.	19.0	21.0	3.0	15 0
Memphis	18.0	20 0	3 0	14 0
Chattanooga	19.0	21 0	3 0	15 0
Nashville	19 0	21 0	3 0	15 0
Bristol	20 0	22 0	3 0	14 0
Lit. Rock, Ark.	20.0	22.0	5.0	12.0

*Tax of 3 cents includes city tax of 1 cent.
*Louisiana kerosene prices include 1-cent state tax and 1-cent parish tax.

SOUTHERN DISTRICT

Standard Oil Co. (Kentucky)

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Atlanta, Ga.	18.0	20.0	4.0	14.0
Augusta	20.0	23.0	4.0	16.5
Macon	17.0	20.0	4.0	13.5
Savannah	18.0	20.0	4.0	14.5
Birm'ham, Ala.	19.0	22.0	4.0	14.5
Mobile	18.0	21.0	4.0	14.0
Montgomery	17.0	20.0	5.0	15.5
Clarks'le, Miss.	18.0	21.0	4.0	11.5
Jackson	18.0	21.0	4.0	11.5
Natchez	17.5	20.5	4.0	14.0
Gulfport	19.5	22.5	4.0	14.0
Vicksburg	17.5	20.5	4.0	14.0
Jack'ville, Fla.	19.0	22.0	5.0	11.5
Miami	21.0	24.0	5.0	14.5
Pensacola	20.0	23.0	5.0	13.0
Tampa	19.0	22.0	5.0	13.0
Lexington, Ky.	18.0	21.0	5.0	15.5
Covington	19.0	22.0	5.0	15.5
Louisville	18.0	21.0	5.0	15.0

In addition to the state tax of 4 cents on gasoline, Montgomery has city tax of 1 cent on gasoline. Kerosene prices in Georgia include 1-cent tax. In Florida, an inspection fee of 0.125 cent; in Alabama, an inspection fee of one-half cent on kerosene only. Pensacola tax includes 1-cent city levy. Gulfport tax includes privilege tax of 2 cents in addition to state tax.

PENNSYLVANIA-DELAWARE AND PART NEW ENGLAND

Atlantic Refining Co.

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Pittsburgh, Pa.	16.0	*22.0	...	13.0
Philadelphia	16.0	*22.0	...	13.0
Scranton	16.0	*22.0	...	13.0
Allentown	16.0	*22.0	...	13.0
Altoona	16.0	*22.0	...	13.0
Erie	13.0	*18.0	...	13.0
Dover, Del.	19.0	22.0	3.0	13.0
Wilmington	19.0	22.0	3.0	12.0
Spring'd, Mass.	18.0	18.0	...	15.0
Worcester	18.0	18.0	...	15.0
Boston	13.0	18.0	...	15.0
Providence, R.I.	20.0	20.0	2.0	15.0
Hartford, Conn.	20.0	20.0	2.0	14.0
New Haven	20.0	20.0	2.0	15.0

*Includes tax of 3.0 cents. Pennsylvania tax is collected by the dealer and paid by him direct to the State.

NEW YORK AND PART OF NEW ENGLAND DISTRICT

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Albany, N. Y.	17.0	19.0	...	15.0
New York*	17.0	19.0	...	15.0
Buffalo	15.0	18.0	...	14.0
Rochester	15.0	18.0	...	14.0
Syracuse	17.0	19.0	...	15.0
Boston, Mass.	18.0	19.0	...	15.0
Augusta, Me.	21.0	23.0	4.0	15.0
Manch't'r, N. H.	21.0	22.0	4.0	15.0
Burlington, Vt.	20.0	22.0	3.0	15.0

*Prices in steel barrels.

NEBRASKA

Standard Oil Co. (Nebraska)

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Omaha	15.25	17.25	2.0	12.25
McCook	14.75	14.75	2.0	11.50
Norfolk	16.75	18.75	2.0	12.75
N. Platte	17.75	19.75	3.0	13.50
Scottsbluff	17.25	19.25	3.0	13.00

PACIFIC COAST TERRITORY

Standard Oil Co. (California)

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
San Francisco	17.0	21.0	3.0	15.5
Pueblo	18.0	18.0	3.0	15.5
Los Angeles	16.5	20.5	3.0	15.5
Reno, Nev.	22.0	26.0	4.0	19.0
Portland, Ore.	17.5	21.5	3.0	16.5
Seattle, Wash.	16.5	20.5	2.0	16.5
Tacoma	16.5	20.5	3.0	16.5
Spokane	20.5	24.5	3.0	20.5
Phoenix, Ariz.	23.0	27.0	4.0	20.5

ATLANTIC COAST DISTRICT

Standard Oil Co. (New Jersey)

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Atlantic City	18.0	20.0	2.0	14.0
Newark, N. J.	18.0	20.0	2.0	14.0
Annapolis, Md.	20.0	23.0	4.0	14.0
Baltimore	20.0	23.0	4.0	12.0
Cumberland	20.0	23.0	4.0	14.0
Washington	18.0	21.0	2.0	14.0
Danville, Va.	21.0	....	5.0	14.0
Norfolk	21.0	24.0	5.0	14.0
Petersburg	21.0	24.0	5.0	14.0
Roanoke	21.0	24.0	5.0	14.0
Richmond	19.0	22.0	5.0	14.0
Ch'rlst'n, W.Va.	20.0	23.0	4.0	14.0
Keyser	20.0	23.0	4.0	14.0
Parkersburg	18.0	21.0	4.0	14.0
Wheeling	20.0	23.0	4.0	14.0
Charlotte, N. C.	20.0	23.0	4.0	14.0
Hickory	20.0	20.0	4.0	14.0
Mt. Airy	20.0	20.0	4.0	14.0
Salisbury	20.0	20.0	4.0	14.0
Charl'ston, S. C.	20.0	23.0	5.0	14.0
Columbia	20.0	23.0	5.0	14.0

ROCKY MOUNTAIN DISTRICT

Continental Oil Co.

	Gasoline—Tank wagon	Gasoline—Service station	Gasoline—Incl'ds tax of	Kero. tank wagon
Denver, Colo.	17.0	19.0	3.0	14.5
Pueblo	17.0	19.0	3.0	14.5
Grand Junction	20.5	22.5	3.0	18.0
Casper, Wyo.	17.0	19.0	3.0	13.0
Cheyenne	18.0	20.0	3.0	14.5
Butte, Mont.	22.5	22.5	3.0	19.0
Helena	22.5	24.5	3.0	19.0
Salt Lake, Utah	20.0	22.0	3.5	17.0
Albu'que, N. M.	22.0	25.0	5.0	17.0
Boise, Idaho	22.5	25.5	4.0	19.0
Twin Falls	23.5	25.5	4.0	19.0

TANK WAGON CHANGES

April 28—Magnol.a Petroleum Co. increased the gasoline tank wagon and station price one-half cent in Texarkana to 16½ cents and 20½ cents.

May 7—Standard Oil Co. of Kentucky advanced tank wagon and service station prices 1 cent in Alabama, Mississippi, Georgia and Florida.

May 8—Standard Oil Co. of Indiana eliminated the 1-cent discount previously allowed on single gasoline dumps within the Chicago district of 100 gallons or more.

AUTO REPLACEMENT MARKET

More than 2,000,000 old automobiles are scrapped annually in the United States, according to data in "Facts and Figures of the Automobile Industry for 1928," published by the National Automobile Chamber of Commerce. This means that there is a yearly replacement market of this size regardless of any approach to the talked-of saturation point to new buyers.

TIDE WATER ELECTION

At the annual meeting of the Tide Water Associated Oil Co., J. Noel Robinson was elected a director to succeed Robert D. Benson. Axtell J. Byles, Francis I. Fallon, Robert McKelvey, E. L. Shea and Henry S. Sturgis were re-elected directors. Mr. Byles was elected president.

COLOMBIA OIL SESSION

President Miquel Abadia-Mendez of Colombia has opened an extraordinary session of congress to consider complaints of North American interests that Colombia's petroleum regulations would result in confiscation of property if enforced.

THE JOURNAL ACQUIRES ADDITIONAL PROPERTY

Although The Oil and Gas Journal has just completed remodeling its present building at 114-116 West Second Street, Tulsa, the available space is already fully utilized and adequate provision for expansion of the business of assembling and publishing the news of the fast-growing petroleum industry has necessitated the purchase of a site for a new building upon an adjoining property.

The property purchased is located on the east side of Cheyenne Avenue, fronting 70 feet on that street and extending back to the west side of the Journal's present building which extends 150 feet south from West Second Street. The new acquisition, embracing 6 300 square feet, will give the Journal 13,800 square feet of ground space.

The property just acquired has erected on it at this time a three-story brick apartment building which will be replaced by the new main building for The Oil and Gas Journal connecting with the present plant.

FOREIGN OIL LAWS

Oil laws of foreign countries are now being collected, studied and published by the Department of Commerce. The development of the petroleum industry in the past few years has resulted in the enactment of new laws by many foreign countries where oil has been found in large quantities, the department stated.

CRUDE OIL PRICES

(Continued from Page 193)

Mule Creek (May 1)	1.10
Grass Creek, heavy	.90
Grass Creek, light	1.33
Elk Basin (March 12)	1.33
Lance Creek (March 13)	1.33
Poison Spider	1.00
Notches	.65
Rex Lake (February 22)	1.10
Osage	1.33
Lost Soldier (contract)	.95
Greybull-Torchlight	1.33
Hamilton Dome	.85
Cat Creek (Mont.)	1.33
Sunburst (Mont.) (Jan. 25, 1928)	1.50
Artesia (March 12)	1.00
Hogback (N. Mex.) (March 14)	1.10

Note: Salt Creek, Osage, Cat Creek, Greybull and Hogback posted by Midwest Refining Co., and the remainder by the Ohio Oil Co. Both companies post Grass Creek light and Elk Basin.

EASTERN STATES

Joseph Seep Purchasing Agency
(Effective December 17)

Penna. Grade Oil in New York Transit Line (New York)	$2.30
Bradford District Oil in National Transit Lines (Pennsylvania)	2.00
Penna. Grade Oil in National Transit Lines (Pennsylvania)	2.00
Penna Crude Oil in Southwest Pennsylvania Lines (West Virginia)	2.00
Penna Grade Oil in Eureka Pipe Line Lines (Pennsylvania)	2.00
Penna Grade Oil in Buckeye Pipe Line Lines (Ohio)	2.00
Cabell Grade Oil in Eureka Pipe Line Lines (West Virginia) (February 9, 1928)	1.30
Corning 35-cent grade oil in Buckeye Pipe Line Co.'s line (December 19)	1.40
Corning 35-cent grade oil in Buckeye Pipe Line Co.'s lines (December 19)	1.40
Somerset Oil in Cumberland Pipe Line lines (Kentucky) (February 9, 1928)	1.40
Ragland Grade Oil in Cumberland Pipe Line lines (Kentucky) (August 1)	.95
Keister (Pennsylvania) (August 1)	1.10

MIDDLE WESTERN STATES

Ohio Oil Co.
(Effective March 14, 1927)

Lima (February 10)	$1.55
Wooster	1.57
Illinois (February 23, 1928)	1.50
Indiana (February 10, 1928)	1.52
Princeton (February 23, 1928)	1.50
Plymouth (February 23, 1928)	1.33
Waterloo (November 17, 1926)	1.35
*Western Kentucky	.133
**Saginaw, Mich., Saginaw Sand (February 10)	1.80
**Saginaw, Mich., Bersa Sand (February 10)	1.70
†Cumberland, Clay, Barren, Clinton and Monroe Counties, Kentucky (March 16)	1.50
‡Oil in lines of Stoll Oil Refining Co. in Oil City, Ky. (March 16, 1927)	1.50
§Oil Springs (Canada) (February 10, 1928)	2.03
§Petrolia (Canada) (February 10, 1928)	1.95

*Posted by Ohio Oil Co.
†Posted by Paragon Development Co.
‡Posted by Stoll Oil Refining Co.
§Posted by Imperial Oil Co., Ltd.
**Posted by Sun Oil Co.

MEXICAN CRUDE

Note—Due to the fact that the exportation of Tuxpam light crude oil has become a negligible factor, prices will no longer be published.

*Panuco heavy (f.o.b. Mexican ports)..$1.15

*$1.15.

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Natural Gasoline Manufacture

TWO COMPANIES ANNOUNCE SALE OF COMPRESSED GAS FOR HOMES

Added interest in the development of means to market the so-called "bottled gas" has resulted from announcements made during the past month by companies who are promoting the sale of the product. The Carbide & Carbon Chemicals Corp. of New York has announced the national distribution of pyrofax gas as the "faultless fuel brought in steel cylinders from the natural gas fields to your own kitchen." The Skelly Oil Co. also has perfected plans for the distribution of Skelgas, a "compressed natural gas."

The products of both companies are designed to serve the same purpose. The aim of the distributors is to furnish gas service to people who at the present time do not have natural gas or artificial gas available. The gas is furnished in portable cylinders coming from a central plant where they are manufactured.

The development is of interest to the natural gasoline industry because potentially it furnishes a large outlet for fractions of natural gasoline or as additional product from raw material now largely wasted. The content of the bottled gas equipment now available varies widely. It is understood that the products of the Carbide & Carbon Chemicals Corp. and the Skelly Oil Co. are largely propane. Other companies are using butane or a butane-propane mixture.

It has been known for some time that the bottled gas could be manufactured but the real problem has been in developing merchandising methods which would make the entire operation profitable. The Carbide and Carbon Chemicals Corp. in a two-page advertisement appearing in the Saturday Evening Post states that the gas is furnished in cylinders containing approximately 5,000 cubic feet of gas. The equipment which the customer buys consists of a steel cabinet containing two cylinders of pyrofax. It is suggested that this cabinet be placed against the rear wall of the house and connection made with the stove.

Although the gas can be adapted to stoves now using the ordinary natural gasoline or artificial gas, the Carbide & Carbon company is selling a complete service including stoves. The company is prepared to distribute the service "by hundreds of conveniently located delivery and service stations."

To market the Skelgas, the Skelly Oil Co. has created the Skelgas Utility Division under the supervision of Earle S. Barber who has had wide experience in advertising and sales work. The gas is manufactured under the direction of the company's natural gasoline department.

Skelgas

In announcing the new product Mr. Barber says in part:

"Skelgas is used exactly like city gas for cooking and heating purposes. It operates in the standard appliances such as ranges, hot plates, heaters, incinerators, laundry appliances, and hot water outfits in exactly the same manner as city gas.

"Skelgas is installed the same way as city gas and connected to the cooking range or other appliances by means of regular gas pipe that taps container of 375 burner hours equivalent of city gas. It is supplied in a special container for convenient delivery and handling.

"Skelgas is natural gas and is not to be confused with gasoline or kerosene pressure equipment, whether the small container of the liquid is attached to the side of the stove or a large contained placed in the basement or outside the house. There are gasoline and kerosene pressure equipments developed today that can adapt themselves to regular gas-range burners wherein the supply container carries about 20 pounds pressure to force the gasoline or kerosene liquid through the feed pipe to the burner and in 30 seconds by burning match or paraffin lighter sufficiently preheat the liquid to vaporize and burn. This is distinctly different from the operation of Skelgas, which is genuine natural gas like city gas and which has inherent pressure and is a vapor at ordinary pressures at temperatures as low as 40 below zero and flows from the container through the feed pipe to the burner as a gas and not as a liquid."

PAMPHLETS ABOUT PETROLEUM

Two handy booklets have been published for the Standard Oil Co. of New Jersey designed to increase popular knowledge about petroleum. One bearing the title "Petroleum" offers 50 pages of information and illustrations covering every phase of the oil industry. Another "The Deluge of Oil," is a series of studies of the current petroleum situation by Isaac F. Marcosson.

Phillips Builds Special Plant in Panhandle Field

A new type gasoline plant capable of handling 60,000,000 feet of lean gas daily designed to meet special conditions in the Panhandle Field of Texas is being built by the Phillips Petroleum Co. The new plant is part of an extensive building program of the Phillips company in the Panhandle area in which new plants are being built and additions made to one plant already operating.

The new 60,000,000-foot plant is located in Section 22, Block Y, M.&C. Survey, Hutchinson County, Texas. The plant will operate on well pressure system, which does away with the necessity of engines for pulling vacuum and for compression and eliminates both capital investment and operating cost to a large extent. It is necessary to have a large volume of gas, for a plant of this nature, and by taking the gas from a large area, the utilization of this method is possible and economical.

This 60,000,000-foot unit will handle what is probably the largest volume of gas of any plant in the Mid-Continent Field. The very nature of the plant necessitates that all equipment be built on a large scale,—large gathering lines, large headers, larger absorbers. However the operation and handling of the plant will be just as simple and easy as a smaller unit.

Some idea of the size of the plant can be obtained by the following facts. The boiler house will contain four portable boilers, any one of which can be removed at any time without disturbing the operation of the plant. In the operation of the cooling system, 2,500 gallons per minute, or the equivalent of 100,000 bbls. of water per day will be circulated. It will be necessary to heat the equivalent of 1,500,000 gallons of mineral seal oil to a temperature of 300 degrees Fahrenheit, and cool it back to below atmospheric temperature during the course of each day's operation.

The cooling tower and coils will be similar to those used in other plants, redwood frame work and admiralty metal cooling coils. The distillation unit will be factory built, leaving only the assembly work to be done on the ground.

With the simplified operation of this plant under the well pressure system, the operating costs of the large unit will be comparatively small. All steam for heating oil will first be used for water and oil circulating pumps. There will be no engine room to care for and very little moving machinery about the plant. The item of water, under certain circumstances would be a large one, but it is

(Continued on Page 200)

SATTERWHITE CHAIRMAN OF SUPPLY ASSOCIATION

At a meeting of the Natural Gasoline Supply Men's Association held in the Tulsa Building May 3, J. H. Satterwhite of Westcott & Greis was elected chairman of the organization meeting which will be held May 15. The association which is an allied organization of the Natural Gasoline Association of America is completing plans for the entertainment of those who attend the annual convention of the latter association to be held in Tulsa, May 22, 23 and 24.

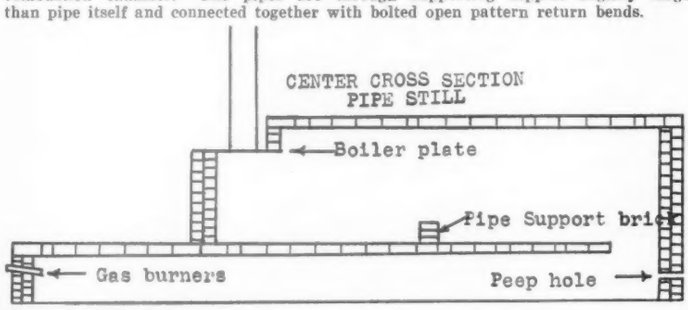
At the meeting May 3 plans for the entertainment were discussed and on May 15, final arrangements will be completed. Mr. Satterwhite will head the organization until the convention when an election will be held and permanent officers elected. Twenty-five companies have joined the new association and additional members are expected before the convention is held.

A Practical Suggestion

FURNACE CONSTRUCTION

In some districts and at certain plants, fire stills are being successfully used and the pipe still, because of lesser fire hazard, is more practical than the common oil field boiler still.

The following method of construction has been applied on a type of furnace which in some cases has operated without a single repair or shut down for as long a period as two years. The furnace proper consists of a wall of ordinary red brick and on the inside a liner of fire brick, the top being made of number one and number two arch brick and flat fire bricks. Combustion takes place in a Dutch oven 8 or 10 feet longer than main part of furnace and extending to within 2 feet of the opposite end of furnace. The stack is on same end of furnace as combustion chamber. The pipes are through supporting nipples slightly larger than pipe itself and connected together with bolted open pattern return bends.



In construction of arch, the starting course along the arch center should be started with the 2½-inch edge of No. 2 arch brick down to furnish a better wedge. The frame or arch center is built of batten strips not more than 2 inches in width. The brick should be dipped on one side and two edges only and tapped in place with a mallet. The thin clay wash for dipping is not used as a cement and has little or no holding power and its action is that of a filler. A course of arch brick should be used only where necessary to keep bottom of the flat brick in evne contact with arch center. When an arch is about two-thirds completed, a trial ring should be laid to determine if the key course will fit.

In the pipe it is better to connect so that all the oil passes through all the pipes, that is, eliminate a header as it is difficult to get the even distribution required. A small amount of steam (low pressure or wet steam sufficient) will prevent coking in the coils and also assist in stripping the oil.

Practical suggestions by those connected with the construction and operation of natural gasoline plants are invited. Payment will be made as soon as suggestions are accepted. Address all communications to the Natural Gasoline Department, The Oil and Gas Journal, Tulsa.

LARGE INCREASE IN CARBON BLACK EXPORTS

Carbon black producers have developed a heavy export business this year, sales running materially ahead of those for last year. February exports amounted to 6,676,953 pounds, against 2,945,121 pounds in February, 1927. Exports for the first two months of 1928 amounted to 13,451,469 pounds, against 7,566,919 pounds in the corresponding period last year.

The Panhandle Field in Texas is coming to the fore as a producer of carbon black. By the end of the year, it is reported, there will be more than a dozen carbon black plants in Texas, mainly in the Panhandle Field. Under the Texas law only residue from natural gas, after it has passed through casinghead gasoline plants, may be burned for making carbon black. Texas produced 20,174,409 pounds of carbon black last year, but is expected to turn out more than 75,000,000 pounds during 1928.

GREATER GALLONAGE IN THE MIDDLE WEST

(Continued from Page 40)

cavalries, in which the Confederates were victorious. The town took its name from a big black-jack tree which stood on the prairie a short distance south of the present site of the town. Southeast of Kansas City on U. S. 50.

Reeds Springs, Stone County, South of Galena: "The Shepherd of the Hills" country and the White River district in the Ozarks are a natural playground. From Reeds Springs or Branson it is only a short drive to the cross roads at Notch, the Matthews homestead, and to Marvel Cave, one of the largest and the most interesting in the United States. This cave contains an enormous and remarkable room, its acoustic properties being so perfect as to earn it the name of "The Auditorium." It contains a mammoth stalagmite of solid Onyx, 80 feet high. Near Reeds Springs is Fairy Cave, located in Fairy Cave Park. Grotesque forms and beautiful colorings are seen in the grand corridor of the cave, a room 225 feet long, 40 feet wide and 125 feet high.

Salem (s): Down in the rugged wilderness of the Dent County hills typical of Ozark character. This town although progressive and modern, still retains the quaint individuality of enjoying life in the leisureliness of the pre-Civil War days. The surrounding countryside is a tempting region of primeval beauty. Massive like oaks and towering pines are seemingly bearded with the white frost of age. M-32, M-19. Twelve miles north of Salem is Indian Trail State Park containing thousands of acres of rugged landscape. Once a favorite hunting ground for the Indians. Stocked with deer and wild turkey. Fine fishing near park boundaries.

Sibley: Noted as the site where Fort Osage, one of the east terminals of the Old Santa Fe Trail was established in 1809, during the Osage Indian War. North of Buckner. Off U. S. 24.

Van Buren: Situated in the heart of the Big Spring Country, in the midst of many interesting works of nature. One of them, the Current River, upon whose banks the town rests, is a swiftly moving mountain stream famed for its abundance of game fish. The stream and the massive hills, which overshade it, offer an ideal vacation spot. U. S. 60. Five miles south is Big Spring State Park, a tract of nearly 5,000 acres. Big Spring, one of the wonders of the world, flows out of the earth at the base of a high limestone cliff.

Leaves From Motorist's Note Book

Still another form of advertising along this line is a series of page advertisements carried by the Indiana company in six motor club publications. Under the caption "Leaves from a Motorist's Notebook" there is a photograph of some beautiful scene. The accompanying letter press is inviting as these examples show:

"There are few places left in the United States where the lover of nature may still find vast tracts of virgin forest practically untouched by civilization. In some parts of the Upper Peninsula the motorists may drive for 20 miles among forests as tangled and untamed as in the days when Marquette and La Salle led their men through the Great Lakes country.

"Civilization has left these woods unspoiled, but has constructed good roads like that shown in the photograph."

Another says: "Nature has been generous in distributing her gifts to the Middle West. Almost anywhere the automobile tourist may drive in the midwestern states he will find vistas of startling splendor. The scene near McGregor, Iowa (shown in the photograph), is only one of hundreds of such beauty spots in the State. The roads are good and driving is comfortable."

Still another picturing "the Jaws of the Dells" says: "A motor trip through Wisconsin is not complete without a visit to the Dells."

"When you are tired of the rush and noise of the city and long for quiet and rest," says another, "take a motor trip to the Country of Pines over the splendid roads that lead through the North Woods."

Similar posters are displayed by the Standard of Indiana at vantage points, each picturing a beautiful scene and all bearing the slogan, "Highways are Happy Ways."

Endorsed by Pierce President

President Edward D. Levy of the Pierce Petroleum Corp., St. Louis, Mo., writes to The Oil and Gas Journal:

"I thoroughly agree that the oil industry should plan its advertising with a view of stimulating the consumption of petroleum products. This corporation had reached that conclusion months ago and we are now working on a definite plan to that end. Our plan consists of several different methods of advertising.

"We believe that motoring will be encouraged if the principal highways are marked with proper mileage signs showing distances between important points and the number of the highway. We have recently completed marking Highway 66 from Springfield, Mo., to the New Mexico state line, a distance of approximately 900 miles. We have placed a 42 by 14-inch Duco sign every 2 miles, staggering them 1 mile apart on opposite sides of the road. The motorists, for instance, traveling between Tulsa and Oklahoma City on this highway, approximately every mile will see how many miles they are from Oklahoma City and how many miles from Tulsa. I am convinced that this does give an added zest and comfort to the motorists—and we are now engaged in marking 5,000 additional miles of principal heavy traveled highways.

"On April 10 we started the distribution of several million trip maps printed on cardboard, 4 by 12 inches. These trip maps are issued in about 50 series. By that I mean they cover about 50 trips on important highways between important points. As an illustration: St. Louis to Springfield, Mo., St. Louis to Indianapolis, Ind., St. Louis to Kansas City, Mo., and many others. On the front of this trip map is printed the map of the road in legend—whether concrete, gravel, dirt, etc.—and on which is printed the names of the towns. On the reverse side of this trip map is printed a list of the towns through which the motorists will pass and between each town is printed the distance in miles between each town, and to the left and to the right of the town names are two columns in which to record the hour and minute the motorist passes each point. This is thought to make motoring more interesting and attractive.

Map Billboards

"We are placing about one hundred 12 by 42 billboards, principally at important junction points on important highways, on which is printed the map of the state in which the billboard is located, and on which is shown distances from that point to important points. Enclosed you will see an excellent picture of this billboard. It is thought that billboards such as this will make motoring more attractive.

"The Pierce Petroleum Corp. will sponsor at Station KMOX, The Voice of St. Louis (radio broadcasting station), a program of 30-minute talks—one-half hour each night for 150 nights, which program will be designated as the Ozark Tour Playground program and from which radio listeners within a radius of 500 miles of St. Louis will be able to hear about the scenic beauties and attractiveness of the Ozarks—the roads, the streams, the state parks, etc. And operating with the Ozark Playground Association, the Pierce Petroleum Corp. will install in its office at 1709 Locust Street, St. Louis, an Ozark tour and travel bureau in charge of a man having intimate knowledge of the Ozark country and its roads, and to whom motorists can apply in person, by wire or letter, for any information regarding the Ozarks, its roads, resorts, hotels, scenic beauties, etc. We are arranging with the state game and fish commissioner to collect by telegram information regarding the fishing streams and we will broadcast this information each night as it is available.

"A careful estimate of the value of such a program convinces us that it is possible through a program of this kind to attract at least 100,000 automobiles into the Ozarks this present motoring season. It is true a large number of those automobiles may come from points in the Ozarks or immediately contiguous thereto, but nevertheless they will all use gasoline and consume lubricating oil."

The local details furnished by the Indiana company's folders and the highway map billboards erected by the Pierce corporation are especially the information sought and needed by the average motorist. However alluring the invitation may be otherwise, the car owner wants to know before he starts figuring on a trip just what sort of road and country he will traverse. Lack of this information is the chief cause for so many cars being left in the garage evenings and weekends which would otherwise be providing pleasure for their owners and greater gallonage for the oil industry.

Effective advertising that would reach the public giving this information would be reflected in a large increase in gallonage this year. Many individual companies realize this and are acting upon it. A national campaign would make it irresistible.

TREND TOWARD HIGHER LUB OIL PRICES IN TEXAS

HOUSTON, Tex., May 8.—A decided trend toward higher lubricating oil prices was apparent in Gulf Coast refinery markets as the week opened with further elimination of competition material and with some sellers up on their quotations.

Buyers on Tuesday found themselves faced with an actually higher market on many grades. The stronger market is backed by considerably lower stocks than at any time in the last two years and as a result of the steady movement and buying of material during April the majority of plants now have their output sold up for 60 days.

The export situation has shown a lull in demand but the curtailing of sources of supply here, due to the shutdown of two refineries several months ago and the steady domestic movement, have brought about a healthy picture.

While there is still considerable pessimism here because of the probability of increased production of lubs in the near future, which, without a greater demand than at present would result in some piling of stocks, again the picture is brightened by the fact that the supply of rich lub-stock crude is declining rapidly. New production being brought in along the Gulf contains less and less lubricating oil which, with the decline of old production, is placing Grade A crude at a premium.

Fuel oils and gas oils were virtually unchanged with bunker C fuel still available around $1.15 to $1.20.

NEW PEAK FOR MID-CONTINENT REFINERS

(Continued from Page 42)

REFINERY OPERATIONS IN NORTH CENTRAL TEXAS

(Plants which have been in operation during the past year)

Name and Location—	Daily Capacity	Runs May 1	Runs Apr. 1
Amarillo Producers & Refiners Corp., Isom	2,000	1,200	1,500
Amarillo Refining Co., Amarillo	6,000	3,000	2,500
American Refining Co., Wichita Falls	6,000	4,000	2,500
Western Oil Corp., Wichita Falls	1,500	(*)	(*)
Bluebonnet Refining Co., Wickett	5,000	3,500	3,000
Central Texas Refining Co., Brownwood	1,000	600	500
Col-Tex Refining Co., Colorado	10,000	8,000	8,000
Continental Oil Co., Wichita Falls	6,000	3,800	3,200
Dale Oil & Refining Co., Electra	2,500	1,800	1,250
Empire Oil & Refining Co., Gainesville	5,000	3,600	4,000
Falls Refining Co., Wichita Falls	1,500	1,000	600
Gulf Refining Co., Fort Worth	10,000	8,500	7,000
Hagaman Refining Co., Tiffin	2,000	200	200
Humble Oil & Refining Co., McCamey	15,000	13,000	12,000
Iowa Park Producing & Refining Co. Iowa Park	2,500	1,200	1,250
Kent-Middleton Refining Co., Angus	4,000	1,800	2,000
Kent-Middleton Refining Co., Minerva	2,500	(*)	(*)
Macmillan Petroleum Co., Isom	5,000	4,700	4,000
Magnolia Petroleum Co., Fort Worth	12,000	5,500	5,600
Magnolia Petroleum Co., Corsicana	5,000	3,200	3,200
Noble Oil & Gas Co., Burkburnett	3,500	3,000	3,000
Odessa Refining Co., Odessa	700	200	200
Olney Oil & Refining Co., Olney	2,000	1,200	1,250
Oriental Refining Co., Dallas	5,000	(*)	(*)
Oriental Refining Co. (Trinity), Dallas†	5,000	2,750	2,750
Orient Petroleum Co., Wichita Falls	2,500	500	250
Panhandle Refining Co., Wichita Falls	4,000	4,000	4,000
Phillips Petroleum Co., Isom	6,500	7,500	3,500
Primrose Refining Co., Wichita Falls	1,500	1,500	(*)
Primtex Refining Co., Grand Prairie	2,500	300	500
San Angelo Refining Co., San Angelo	2,000	1,000	1,000
Simms Oil Co., Dallas	5,000	5,000	4,000
Star Refining & Producing Co., Fort Worth	1,800	500	1,000
Swastika Refining Co., Muenster	1,000	(*)	(*)
Sweetwater Refining Co., Sweetwater	600	300	300
The Texas Company, Dallas	15,000	12,000	12,000
Tidal Western Refining Co., Burkburnett	3,000	2,000	2,000
Texas Pacific Coal & Oil Co., Fort Worth	3,000	2,100	2,000
Transcontinental Oil Co., Fort Worth	5,000	3,500	3,000
Waggoner Refining Co., Electra	3,400	2,200	2,900
White Eagle Oil & Refining Co., Fort Worth	5,000	(*)	(*)
‡Wickett Refining Co., Wickett	2,500	bldg.	....
Valley Refining Co., Wichita Falls	2,500	(*)	(*)
Valley Refining Co., Pyote	2,500	2,000	1,000
Total	195,000	120,450	107,050

*Shut down. †Operated by Magnolia Petroleum Co. ‡Runs tops only.

REFINERY OPERATIONS IN NORTH LOUISIANA

(Plants which have been in operation during the past year)

Name and Location—	Daily Capacity	Runs May 1	Runs Apr. 1
Crystal Oil Refining Corp., Shreveport	14,000	8,000	9,000
Dixie Oil Co., Superior	3,000	2,500	bldg.
Louisiana Oil Refining Corp., Shreveport, Bossier	24,000	24,000	20,000
Shreveport Producing & Refining Co., Shreveport	8,000	8,000	7,000
The Texas Company, Shreveport†	6,000	6,000	6,000
Total	55,000	48,500	42,000

†Topping.

REFINERY OPERATIONS IN ARKANSAS

(Plants which have been in operation during the past year)

Name and Location—	Daily Capacity	Runs May 1	Runs Apr. 1
Henry H. Cross Co., Smackover	5,000	5,000	4,500
Houston Oil Co., Camden	3,000	(*)	(*)
Kettle Creek Refining Co., Pearson	3,000	3,000	2,000
Lion Oil & Refining Co., El Dorado	12,000	7,100	6,000
Macmillan Petroleum Products Co., El Dorado	1,800	1,450	800
Ouachita Valley Refining Co., El Dorado	1,000	1,000	700
Root Refineries, El Dorado	3,500	3,400	3,200
Simms Oil Co., Smackover	3,000	2,500	2,500
E. M. Tulle, El Dorado	1,000	(*)	(*)
Total	33,300	23,450	19,700

*Shut down.

Oil Securities Sell Off Slightly

Acted Well as a Group With No Indication of Weakness but With Only Limited Activity Monday

After 10 days' heavy activity, the oil stocks sold off slightly this week. They acted well as a group with no indications of weakness, but displayed only a limited activity.

Standard of New York declined when its financial statement was issued. Unsatisfactory earnings was assumed to be the cause for the softness in this issue.

The close of the week observed general declines in the majority of the oils as compared with their close of last week.

Chairman Van Dyke Optimistic

Further improvement in the earnings of the Atlantic Refining Co. was forecast by Chairman J. W. Van Dyke at the annual meeting of stockholders in Philadelphia.

"We are now pleased to be able to say," the chairman told stockholders, "that present conditions are very different from those of a year ago, that while crude oil prices are still at the lowest and are undoubtedly quite below the true cost of production for adequate supplies, and while producing prices are influenced accordingly, the trend is toward higher levels, thus rendering it possible for the business of your company to be normally conducted.

"It is our hope that the nine months still to be accounted for in the present year will yield better returns than did the same months of last year. This hope is based in part upon reductions in operating expenditures which are now being realized; in part at least from expenditures made in 1926-1927 for improvements in plant and facilities.

"As an approximate comparison, we will mention that although thus far in 1928 your company has produced more crude oil, has processed greater gallonage at its refineries and has marketed somewhat larger quantities of products than during the same months of 1927, its cash outlay for operating expenses of all kinds, including payrolls but excluding cost of raw materials, was for the three months under review $944,000 less."

Standard of New York

Report of Standard Oil Co. of New York and subsidiaries for year ended December 31, 1927, shows net profit of $11,414,887 after Federal taxes, depreciation, depletion, interest, etc., equivalent to 66 cents a share (par $25) earned on 17,118,931 shares of stock. This compares with net profit of $32,776,502 in 1926, which included earnings of General Petroleum Corp of California, from date of acquisition, May 18, or $1.94 a share on 16,809,931 shares in preceding year.

After payment of $27,191,090 in dividends, deficit for the year was $15,776,203 against surplus of $9,319,711 in preceding year after dividend disbursements of $23,456,791.

Consolidated income account for 1927 compares as follows:

	1927	*1926
Net after tax	$52,934,399	$71,646,813
Depr., depl., and ins. reserve	35,778,774	35,909,557
Interest	5,740,738	2,960,754
Net profit	$11,414,887	$32,776,502
Dividends	27,191,090	23,456,791
Deficit	$15,776,203	‡$9,319,711
P. & L. surplus	86,758,712	†94,651,700

*Includes earnings of General Petroleum Copr. of California from May 18, 1926, date of acquisition. †After payment of $71,691,103 stock dividend. ‡Deficit.

Surplus account follows: Surplus January 1, 1927, $94,651,700; add insurance reserve of prior years in excess of requirements, now restored to surplus, $4,756,986; premiums on capital stock issued in 1927, $2,733,000; adjustments (net), $393.229; net profit for 1927, $11,414,887; making total credits $113,949,802; deduct dividends paid, $27,191,090, leaving profit and loss surplus on December 31, 1927, $86,758,712.

Consolidated balance sheet of Standard Oil Co. of New York as of December 31, 1927, compares as follows:

Assets	‡1927	‡1926
†Real estate, plant, etc.	$443,367,687	$414,496,656
Investments	8,327,152	6,269,579
Def. assets	7,663,537	7,235,953
Cash	14,040,705	34,993,169
Matl. and supplies..	21,640,954	24,666,563
Crude oil and petroleum	135,092,340	151,187,870
Mark. securities	3,003,182	3,467,612
Accts., notes rec.	44,953,217	49,104,528
Total	$678,088,774	$691,211,930
Liabilities		
*Capital stock	$427,973,275	$420,248,275
Funded debt	104,006,000	114,172,500
Pur. mon. ob.	$3,851,640	
Ins. reserve, etc.	7,909,068	12,777,233
Def. credits	6,159,968	6,235,752
Taxes payable	6,031,286	3,773,114
Accts. payable	35,398,825	39,353,356
Surplus	86,758,712	94,651,700
Total	$678,088,774	$691,211,930

*Par $25. †After depreciation and depletion. ‡Includes General Petroleum Corp. of California in 1927 and 1926. §Of which $1,389,596 mature in 1928.

Price Appreciation

Shares of 16 of the leading oil companies at their closing prices April 28 were selling at a combined price level which represented a gain of $1,201,872,262 over their aggregate market value at their low prices for 1928, according to a compilation by Dow, Jones & Co.

This price appreciation has been accompanied by unusually heavy trading volume in practically all petroleum stocks, representative of both the large and small companies.

So far as the big integrated units are concerned, the basis of price increase is attributed to better earnings resulting from the higher market for gasoline. With crude oil still selling at last year's low levels, the larger refining companies are getting a wider profit on gasoline, the principal revenue producer of petroleum products.

Though stocks of leading independents of varying size have shared in the upward movement in the stock market, the profits of these companies have not shown any appreciable increase because crude oil prices have not been advanced.

Of the total increased price six integrated units, four of them Standard Oils, were responsible for $836,000,000, or about two-thirds of the total gain of the group of 16 issues. Standard Oil Co. of New Jersey was the leader with an appreciation of $233,343,275 at the close April 28 from the year's low. Others showing large price appreciation, on the same basis, were Standard Oil Co. of New York, Standard Oil Co. of California, Gulf Oil, The Texas Corporation and Standard Oil of Indiana, in the order of gains recorded.

The following tabulation shows the advance at the close April 28 in points and dollar value over the year's low:

	Advance from low	Advance in value of outstanding stock
Gulf Oil	25⅝	$112,921,693
Humble Oil	25⅝	75,896,271
Marland Oil	10⅝	24,910,162
Pan American	14	14,086,086
Pan American B.	15¼	36,934,607
Phillips Petroleum	8⅜	20,962,496
Prairie Oil & Gas	7	16,849,000
Shell Union	5⅝	56,250,000
Sinclair	12⅝	54,677,445
S. O. of Calif.	9⅞	124,366,716
S. O. of Indiana	9⅜	90,007,515
S. O. of N. J.	9¼	233,343,275
S. O. of N. Y.	10⅜	173,278,500
Texas Corporation*	12½	102,793,825
Tide Water Assoc.	5⅝	25,672,736
Vacuum Oil	15½	38,931,921
Total		$1,201,872,262

*Allows for exchange of 96 per cent of California Petroleum Corp. stock.

Independent Oil & Gas Co.

Independent Oil & Gas Co. and subsidiaries report for quarter ended March 31, 1928, net loss of $419,398 after interest, depreciation and depletion comparing with net profit of $634,530 or $1.26 a share on 500,000 no par shares of stock in first quarter of 1927. Consolidated income account for quarter ended March 31, 1928, compares as follows:

	1928	1927
Gross earnings	$3,382,495	$3,031,589
Ex. or taxes, etc.	2,174,162	1,698,165
Interest and discount	165,009	93,744
Operating profit	$1,043,324	$1,289,771
Depr. and depletion	1,462,722	625,241
Est. Federal taxes		30,000
Net loss	$419,398	*$634,530

*Profit.

Texas Pacific Coal & Oil

Texas Pacific Coal & Oil Co. reports for quarter ended March 31, 1928, profit of $394,080 after expenses and charges, but before depreciation and depletion, comparing with $693,936 in first quarter of 1927. Outstanding stock amounts to 844,804 shares of $10 par.

Income account for quarter ended March 31, 1928, compares as follows:

	1928	1927
Gross	$1,877,265	$2,181,566
Expenses	1,549,912	1,485,129
Operating profit	$327,353	$696,427
Other income	117,288	13,991
Total income	$441,641	$710,418
Deductions	50,561	16,482
*Profit	$394,080	$693,936

*Before depreciation and depletion.

New York Oil Co.

Negotiations for the sale of the New York Oil Co.'s interests in the Salt Creek Field, begun last December, are reported to have been concluded. The price paid was about $2,000,000, the Midwest Refining Co acquiring 50 per cent interest and the Salt Creek Producers Association, through Midwest Oil Co., and the Mountain Producers Corp., through Wyoming Associated Oil Co., subsidiaries, each acquiring a 25 per cent share in the New York Oil Co.'s royalty working interests.

The transaction also included the purchase by George M. Foreman & Co. of Chicago, of the gas-producing properties, pipe line and distribution systems in Casper and other Wyoming cities of the New York Oil Co. The price paid was $3,750,000. The heavy oil properties of the company on the Boone, Poison Spider and other structures were acquired by the Empire State Oil Co. for $58,750 in

LIST OF ACTIVE PETROLEUM STOCKS

Stocks—	Par	Clos. Quot. May 7	Clos. Quot. Apr. 30	1928 High	1928 Low	1927 High	1927 Low	1926 High	1926 Low
Amerada Corp.	..	35⅜	36	38	27⅛	37⅛	27⅝	32⅜	24¾
Atlantic Refining, com.	100	135	139¼	139½	95¾	131¾	107	128¾	97
Barnsdall A	25	25	26⅛	26⅞	21⅛	35½	20¾	32½	23½
California Petroleum, com.	25	31¾	31¼	31	24	32⅞	20	38⅛	30⅞
Houston Oil	100	146½	153⅛	166¾	127	175¾	60⅛	75	50¼
Independent Oil & Gas	..	28⅞	30⅝	31⅞	21⅜	32⅜	17⅝	34	20¼
Louisiana Oil	10	17⅛	18⅝	19¾	9⅜	18⅛	10½	19⅝	12
Maracaibo	..	19½	22	18⅛	12½	22⅜	12	27¾	18⅜
Marland	..	41¼	42¼	44	33	58⅛	31	63⅜	41¼
Mid-Continent Petroleum	..	31⅛	33	33½	25½	39⅝	25½	41	25⅝
National Supply	50	104	104½	110	90	95¾	76	84⅞	55⅛
Oil Well Supply	25	42	52	41	30	44⅝	31¼	36	30
Pan American, B	50	52	53⅝	54⅝	37⅜	66⅜	45¼	72⅜	56⅛
Pan American, Western B	..	25	27¾	28½	18½	37⅞	16¾	46	34
Phillips Petroleum	..	42½	43⅝	44⅝	35¼	60⅛	36½	54⅞	42½
Producers & Refiners	50	23⅜	25½	26⅞	16	33⅞	16⅝	26	11
Pure Oil, com.	..	25	26	27½	19	33½	25	31	25⅝
Royal Dutch, N. Y., sh.	13.40	54⅜	52⅝	53⅝	44⅝	54½	44¼	57⅝	49⅝
Shell Transport	10	46⅜	46⅞	44	39⅜	49	41½	48⅞	42
Shell Union, com.	..	29⅞	29⅝	31	23¼	31⅝	24⅝	30⅞	24
Simms Petroleum	10	23⅝	23⅞	25½	18⅛	23⅞	14¼	25⅝	16⅛
Sinclair Consolidated	..	28⅜	29⅝	30¾	17⅛	22⅝	15⅜	24⅜	16⅝
Skelly Oil	25	31⅛	33½	34	25	37⅝	24⅛	37⅛	27
Standard of California	25	62	63	63⅞	52	60⅝	50⅜	63½	54
Standard of New Jersey, com.	25	45⅝	47⅜	49	37⅜	41⅜	35⅛	46⅝	37½
Standard of New York	25	37⅜	40¼	41½	28⅝	34½	29⅝	47¼	30⅝
Sun Oil Co.	..	47⅝	44⅝	44⅝	31½	34⅞	30	41¼	30⅛
The Texas Company	25	62¼	62⅝	63⅞	50	58	45	58	48
Texas Pacific Coal & Oil	10	15½	16⅞	17⅜	12⅛	18⅞	12	19½	12⅛
Tide Water Associated	..	19⅝	20⅛	20⅝	14⅜	19⅛	15⅝	21	17
Transcontinental	..	8⅝	9⅞	10½	7⅛	10⅝	3⅝	5½	3
Union Oil of California	25	53	55⅝	57	42⅝	56⅛	39⅝	53⅝	37¼
Union Tank, com.	100	125	124⅝	125	119¼	126	94	120⅜	84¼
White Eagle Oil & Refining Co.	..	24½	25⅝	25⅝	20¼	27½	21⅜	29⅜	25½
Standard Oils									
Anglo-American	£1	20¼	19⅝	22⅜	18½	21⅝	17¼	19⅜	16⅛
Borne Scrymser	25	55	*50	56	50	69	49½	75	65
Buckeye Pipe Line	50	73¼	*73¼	70	58	59	45	69½	42
Chesebrough Manufacturing Co.	25	156½	*150	149¾	117¼	126	76½	81¼	63
Continental	10	19⅛	19⅞	23	16	22⅝	16¼	25⅜	10¼
Cumberland Pipe Line	100	104½	103¼	105	89	‡137	90	137	102
Eureka Pipe Line	100	85	86	72¾	64¼	66	47	43¾	43
Galena Signal, com.	100	10	11	7⅝	4	13½	4½	32¼	9⅞
Humble Oil & Refining Co.	25	79½	81¼	84⅞	59½	67⅜	54	99⅝	52
Illinois Pipe Line	100	211¾	211	214½	176½	181½	123¾	144	131
Imperial Oil	..	70	64⅝	65¼	56⅞	64⅜	37⅝	39⅜	32¼
Indiana Pipe Line	50	88	86	89½	75	93	61	68	52¼
International Petroleum Co.	10	42½	42¼	43	35	36⅜	28¼	35¼	28¾
National Transit Co.	12.50	29⅜	30½	30½	20½	23¼	13¼	30¾	27¼
New York Transit	100	59	60	54	38½	42	31¼	61½	27¼
Northern Pipe Line	100	121½	121	120¾	94	96	70	80½	64
Ohio Oil Co.	25	65½	66⅞	66½	58½	66	52	67¾	55⅝
Penn-Mex Fuel	25	55	78	81	33	36½	12	24¼	15
Prairie Oil & Gas	25	53½	55	56	47⅝	55½	45⅝	60¼	49
Prairie Pipe Line	100	215	217	224	184	189¾	132	137½	122½
Solar Refining Co.	100	185	*172	178	175	‡201½	178	212	184½
South Penn Oil	25	48¼	52	52	36⅝	41½	34½	50	30
Southwest Pa. Line	100	100	*81	88¾	70	78	55½	56	47½
Southern Pipe Line	50	33	*32	33½	21	39	18½	27	34
Standard of Indiana	25	80½	82¼	83⅝	70⅝	80¼	64⅝	70½	60½
Standard of Kansas	25	24	24⅞	27⅝	15	20⅞	15⅝	36½	26½
Standard of Kentucky	25	132½	133⅝	136½	122½	125½	111½	134⅝	107
Standard of Nebraska	25	44⅜	45	45½	40½	49½	43	51¼	42
Standard of Ohio, com.	100	78½	77¼	79⅝	72	81½	73	363	192½
Swan & Finch, com.	25	19	19	17⅜	16½	21	11½	21	18
Vacuum Oil	25	†86⅝	156½	154	136⅝	147	95½	109⅝	94½
Miscellaneous									
Gulf Oil Corp. of La.	25	128	128½	130	101⅛	116	86¼	95	82½

*Bid, no sales. ‡Old stock. †New stock.

Quotations furnished by W. J. Wollman & Co.

The Oil and Gas Journal weekly average price of 20 representative petroleum stocks listed on the New York Exchange and New York Curb was as follows:

May 7	68.15	Apr. 2	65.28	Feb. 27	62.54	
Apr. 30	71.31	Mar. 26	64.48	Feb. 20	60.77	
Apr. 23	68.76	Mar. 19	63.79	Feb. 13	61.02	
Apr. 16	69.43	Mar. 12	62.07	Feb. 6	62.03	
Apr. 9	67.31	Mar. 5	62.56	Jan. 30	62.75	

cash and 300,000 $1 par shares of stock. Bonds of the New York Oil Co. totaling $1,250,000 will be retired out of the proceeds.

Vacuum Dividend

Vacuum Oil Co. has declared a quarterly dividend at the rate of 75 cents per share, payable June 20 to stockholders of record at the close of business May 31.

Standard Oil Co. of California

At the annual meeting of the Standard Oil Co. of California the board of directors was re-elected. Officers were re-elected as follows: K. R Kingsbury, president; R. J. Hanna, vice president; H. M. Storey, vice president; H. T. Harper, vice president; W. H. Berg, vice president; R. C. Warner, treasurer. H. D. Collier, R. W. Hanna, Oscar Sutro and M. E. Lombardi are the other directors. Regular dividend, 62½ cents, was declared.

IMPROVE GAS USE BY LABORATORY WORK

(Continued from Page 41)

establishment have been improved until they complied with our performance requirements which include the examinations for completeness of combustion; 99.6 per cent were improved from the standpoint of construction. New gas ranges were submitted that produced as high as 2 per cent carbon monoxide in the air-free products of combustion when operating under ideal conditions. Several water heaters examined disclosed quantities of carbon monoxide as high as 12 per cent in the stack gases. All such appliances have been corrected until they will now operate with absolute safety to the customer, if properly installed, under all reasonable conditions of service While the majority of gas appliance manufacturers are still producing unapproved appliances, the greater number of appliances sold during the present year will bear the Blue Star Seal of Approval. It is estimated that 30 per cent of the gas boilers, 30 per cent of the furnaces, 50 per cent of the water heaters, 60 per cent of the space heaters and 75 per cent of all gas ranges sold during the year of 1928 will bear the approval seal of the A.G.A. laboratory.

In slightly over two years' operation, our establishment examined and approved from inspection or test 273 gas boilers, 41 warm air furnaces, 16 types of flexible tubing, 193 water heaters, 413 space heaters and 7,088 gas ranges, making in all a grand total of 3,019 types of approved tubing and appliances.

All of our gas companies are co-operating to the fullest extent in bringing about a condition where nothing but certified equipment will be offered to the public for the safe and efficient use of manufactured or natural gas.

Our requirements specify that every approval appliance must be marked permanently with the laboratory's Blue Star Seal of Approval. This emblem signifies that the appliance to which it is attached meets the industry's basic standards for safety and efficiency in performance and reasonable durability in construction. In its broadest sense, it is not an index of monetary value; in fact, it may have no particular relationship to this item. The sales price of appliances depends on considerations which are absolutely foreign to the purpose of our approval requirements. For example, our standards do not specify how elaborately an appliance must be constructed, yet this one item is probably the prime consideration in establishing its purchase price.

Gas Ordinances

A development of interest to every gas man is the large number of cities that are interesting themselves in gas appliance ordinances. Baltimore, Md., Hartford, Conn., Berkeley, Calif., Los Angeles, Calif., Cohoes, N. Y., Greenwich, Conn., and New York City are all enforcing some type of legislation regulating the sale and installation of gas appliances, or tubing. Some 45 other cities, among which may be included almost every large city in the State of Texas, are also considering similar kinds of legislation.

The American Gas Association is not fostering the enactment of gas ordinances. However, where a real need for legislation of this kind is expressed by interested city officials and the local gas company, an effort is always made to guide such activities in the right direction. A model ordinance quite similar in most of its essential details to the Baltimore draft has been prepared and submitted to our executive board for approval. The basis for all of the ordinances mentioned is that the appliances affected must meet the requirements established by interested governmental experts and our appliance committees. Consequently, the association is not only interesting itself in improving gas-burning appliances but, where necessary, is also assisting interested municipalities in adopting ordinances to enforce the use of those of proven merit.

Baltimore was the first city to adopt an ordinance of this kind and its first full year's application shows a reduction of approximately 38 per cent in the number of accidental asphyxiations.

Mixing Gases

Early in 1926, the committee on engineering and economic survey of our technical section decided that the problems connected with the practice of mixing gases were of major importance to the advancement of gas in the field of competitive fuels and assigned their solution to the laboratory. The practice of mixing gases not only makes possible the augmentation of failing supplies of natural gas but also permits the use of gases often cheaply available as by-products of other industries. It opens the way to varying plant equipment, thus leading to economy in production. By variations in the proportions of the component gases where mixed gases are served, variations in the markets for both raw materials and by-products of gas manufacturing processes may also be used to the greatest advantages in reducing production costs. At the same time, the use of one process for usual demands and another for peak loads may materially lessen capital investments for operating companies. In short, the practice of mixing gases tends to increase the flexibility of gas producing equipment from the standpoint of both economy and plant operation.

The mixed gas research committee, which includes a number of prominent natural gas men, supervises the activities connected with our mixed gas research work. This group decided that the first stages of the investigation should be devoted to a study of the effect of variations in the factors of gas service which have a direct effect on appliance operation. It was decided that the most accurate and prompt method of determining the desired results experimentally would be to isolate each of the controlling factors by keeping all others constant during each step of the investigation. Important variables controlling the successful mixing of gases are specific gravity, heating value, chemical composition, and gas pressure. The last mentioned item becomes of importance only when it is varied to compensate for specific gravity or heating value changes.

Allowable Variations

Gas company executives considering the advisability of mixing gases are usually more interested in allowable variations in specific gravity than in any other similar item Therefore, it was decided to investigate this phase first. Experiments were begun on manufactured gas mixtures with resultant heating values of about 550 B.t.u. and specific gravity variations of from 0.37 to 0.65.

It was found that for the usual types of domestic gas appliances and several types of industrial equipment, that specific gravity variations of 10 per cent downward and 20 per cent upward could be accommodated without necessitating changes in adjustment and any appreciable reduction in the quality of service rendered. These findings were later checked on manufactured gas mixtures of

Continuous Satisfactory Service to the Producer and Consumer of Natural Gas

Union Gas Corporation

OPERATING IN KANSAS

Osage Gas Producing Company

OPERATING IN OKLAHOMA

Independence, Kansas

450 B.t.u. per cubic foot and are to be verified by testing mixtures of manufactured and natural gas. However, they now seem sufficiently conclusive to be regarded as at least approximately correct for any kind of city gas.

At the present time, allowable variations in heating value are being studied by mixing blue and carbureted water gas with natural gas. In this particular series of tests, specific gravities are being kept constant so that the effect of varying this item may be eliminated from consideration and basic information secured on allowable limits in mixing natural and blue gas or carbureted water gas as well as the permissible limits for varying heating values. Some research work conducted for the purpose of determining the utilization characteristics of manufactured gas enriched with natural gases has also been completed. To date, approximately 17,000 separate tests have been performed in determining the findings reported.

Practically every successful industry is now spending vast sums of money in scientific research. It is estimated that, during the year of 1928, approximately $200,000,000 will be expended for such purposes. It is reported that the American Telephone and Telegraph Co., alone, made expenditures of over $15,000,000 last year for such purposes. In fact, we learn that this one organization expended approximately $1,000,000 in merely demonstrating television. The continued growth of such establishments as the General Electric Co.'s laboratories in Schenectady and Cleveland are hopeful signs and indicate the essential value of institutions of this kind to the electrical industry. These are only two examples of many other similar activities. Undoubtedly, our own testing organization will eventually find its greatest usefulness in the field of scientific research.

TEXAS PANHANDLE FIELDS

(Continued from Page 47)

1,609 feet; The Texas Company's No. 1 Coleman at 1,502 feet; Consolidated Oil Co. of Texas' No. 1 Kinder at a total depth of 1,325 feet; Panhandle Refining Co.'s No. 1 Farmer at 1,601 feet. Panhandle and Johnson's No. 3 Garvey made 15 bbls. at 770-80 feet. Elvin Oil Co.'s No. A-1 Crawford was dry and abandoned at 1,561 feet.

Clay County

Lone Star Gas Co.'s No. 26 Holloway was dry and abandoned at a total depth of 1,707 feet.

Collins County

Verona Production Co.'s No. 1 Watkins was temporarily abandoned at 1,608 feet.

Cooke County

Oil Operators Trust Co.'s No. 1 Haigler was dry and abandoned at 2,502 feet. H. H. Simpson and others' No. 1 Houston was junked and abandoned at a depth of 2,965 feet.

Grayson County

Richardson Brothers' No. 1 Taylor was temporarily abandoned at 2,545 feet.

Knox County

Deep Rock Oil Co.'s No. 1 Coffman encountered a hole full of water at 4,505-16 feet and was dry and abandoned at a depth of 4,516 feet.

Montague County

R. I. Carter's No. 5 Bouldin made 20 bbls. at 809-19 feet. Oil Operators Trust Co.'s No. 10 Bouldin made 15 bbls. at a depth of 819-29½ feet. No. 9 Bouldin made 18 bbls. of oil and 5 bbls. of water at 823-33 feet.

Wichita County

Apple & Brandebury's No. 2-A Jennings made 75 bbls. of oil at 1,799-1,820 feet. Bulling-Pendleton & Lee's No. 1 Fassett was dry and abandoned at 1,859 feet. Coleman & Coppock's No. 8 Kemp & Kempner pumped 92 bbls. at 846-61 feet. Hammon and others No. 2 McCarty was temporarily abandoned at a depth of 725 feet; No. 3 McCarty made 3 bbls. from the pay at 238-44 feet; No. 6-A McCarty made 30 bbls. at 1,330-56 feet; and No. 7 McCarty made 90 bbls. at 1,334-71 feet. Halbrook & Wood's No. 18 Kemp & Kempner made 80 bbls. at 850-66 feet, and No. 19 made 20 bbls. at 865-870 feet. T. F. Hunter's No. 32 Waggoner Brothers made 3 bbls. at 643-50 feet. Merrick Drilling Co. and others' No. 1 J. F. Boyd was dry and abandoned at 1,850 feet. W. B. Omhundro's No. 9 Chilson was dry and abandoned at 830 feet and also No. 2-A at the same depth. Petroleum Production Co.'s No. 9-8-B Love was dry and abandoned at 516 feet, and No. 11-8-B Love was also dry and abandoned at 520 feet.

Petroleum Production Co.'s No. 12-B M. A. Love made 12 bbls. of oil at 488-96 feet. The same company's No. 13-B made 3 bbls. of oil at 178-92 feet. Ryan Petroleum Corp.'s No. 92 G. L. Nanae swabbed 470 bbls. the first 24 hours from the 1,351-foot pay, and its No. 93 pumped 40 bbls. from 1,346-71 feet. Shappel Oil Co.'s No. 1 Lewis was dry and abandoned at 1,780 feet.

The Texas Company's No. 1 Sue Mitchell was dry and abandoned at 1,954 feet, and its No. 348 W. T. Waggoner was dry and abandoned at a total depth of 2,251 feet. F. E. Van Warmer's No. 9 J. A. Fisher was shot with 5 quarts at 834-58 feet and made an 8-bbl. well.

Wilbarger County

Fain-McGaha Oil Corp.'s No. 4 Waggoner pumped 110 bbls. of oil at 2,286-2,305 feet. Same company's No. 5-M Waggoner pumped 170 bbls. at 2,326-50 feet. Its No. 1-R Waggoner was dry and abandoned at 1,185 feet. Murchison Oil Corp.'s No. 1-G Waggoner was dry and abandoned at 1,610 feet. Prairie Oil & Gas Co.'s No. 8 Waggoner pumped 60 bbls. of oil at 2,387-2,410 feet.

Young County

Bullington Lee & Pendleton's No. 2 Boone made 25 bbls. at 485-94 feet. Kleiner and others No. 6 Langston pumped 25 bbls. of oil at 560-87 feet. Parker and others' No. 2 Johnson made 7 bbls. at 571-81 feet. Riggs and others' No. 6 McKinley pumped 400 bbls. at 581-96 feet. Shaw, Riggs and others' No. 4 McKinley made 3 bbls. at 585-604 feet. Stafford's No. 2 Langston made 11 bbls. at 567-90 feet.

The following wells were dry and abandoned: Allen & McKee's No. 1 Hickerson at a depth of 605 feet; Boller and others' No. 1 Minkley at 602 feet; Chancellor & Anderson's No. 1 Grubbs at 555 feet; Chandler and others' No. 1 Ferguson at 540 feet; Clarida's No. 1 fee at 688 feet; Clark and others' No. 1 Vance at 603 feet; Continental Oil Co.'s No. 1 Weickman at 1,202 feet; Cooper & Barrett's No. 1 Hutchings at 1,014 feet; Cunningham and others' No. 1 Dunan at 538 feet; Martin and others' No. 1 Smith at 626 feet; Scott and others' No. 1 Kirby at 602 feet; Shappell Oil Co.'s No. 1 Cox at 818 feet; Roberts Oil Corp.'s No. 1 Burk at 2,501 feet.

RANGER DISTRICT

Week ended May 5

Brown County

Amerada Petroleum Corp.'s No. 1 Beck was dry and abandoned at 1,395 feet. Cranfill & Reynolds' No. 1-A Kellar was shot with 10 quarts at 1,188-1,206 feet and made 100 bbls. Danciger & Cohens No. 7 Haynes was dry and abandoned at 1,221 feet. Henshaw Oil Corp.'s No. 11 Bush made 140 bbls. at 1,089-1,100 feet and its No. 12 made 40 bbls. at 1,094-1,104 feet. Humble Oil & Refining Co.'s No. 5-A Kilgore made 16 bbls. at 1,094-1,121 feet, and its No. 12 made 51 bbls. at 1,160-84 feet. Kone Production Co.'s No. 1-C Hickman was shot with 10 and 15 quarts at 1,258-84 feet and dry and abandoned at 1,286 feet. Peckham and others' No. 4 Bush made 20 bbls. at 1,120-28 feet, and their No. 1 Newton made 5 bbls. at 1,131-42 feet. Phillips Petroleum Co.'s No. 12 Hickman was shot with 19 quarts at 1,240-61 feet and produced 200 bbls. Shuler & Davies' No. 2 Boysen was dry and abandoned at 1,250 feet. Van Bebber and others' No. 1 Mullins was dry and abandoned at 1,270 feet. Van Bebber & Lehman's No. 6 Evans was dry and abandoned at 1,780 feet. Winkler's No. 1 Black was dry and abandoned at 1,264 feet.

Coleman County

Chestnut & Smith and Eastland Oil Co.'s No. 3 Morris was dry and abandoned at 2,115 feet and their No. 4 Morris was dry and abandoned at 3,318 feet. Taylor and others' No. 1 Henderson was dry and abandoned at 2,068 feet. Humphrey Brothers, Inc., No. 1 Rutherford was dry and abandoned at 1,310 feet. Mid-Sun Oil Corp.'s No. 2 Guthrie was dry and abandoned at 1,034 feet. Taylor-Link Oil Co.'s No. 1 Miller was dry and abandoned at 2,502 feet.

Comanche County

Welsh and others' No. 1 Cozby was temporarily abandoned at 2,560 feet.

Eastland County

Amerada Petroleum Corp.'s No. 1 Roberts was dry and abandoned at 1,045 feet. Barkley and others' No. 4 Duffer was dry and abandoned at 3,006 feet. Goodwin and others' No. 2 Parker made 13 bbls. at 1,435-60 feet. Parsons and others' No. 2 Scott encountered 8,000,000 feet of gas at 3,130-57 feet. Forster and others' No. 1 Spencer was dry and abandoned at 1,346 feet. Mexana Oil Co.'s No. 1 Bowers was dry and abandoned at 1,353 feet.

Palo Pinto County

Bullington-Lee and others' No. 1 Webster encountered 6,000,000 feet of gas at 1,330-36 feet.

Shackelford County

Petroleum Production Co.'s No. 3 Matthews made 100 bbls. of oil at 1,131-48 feet. Roeser & Pendleton and Marland's No. 1-A-53 was dry and abandoned at 2,600 feet. Tannehill Oil Co.'s No. 2-27 Matthews made 20 bbls. of oil at 1,144-62 feet, and its No. 2-33 made 30 bbls. at 1,135-1,145 feet. E. M. Treat Oil & Gas Co.'s No. 2 Matthews made 10 bbls. at 1,168-70 feet, and its No. 3 Matthews made 240 bbls. at 1,162-67½ feet.

Stephens County

Charter Oil Co.'s No. 1 Tomlinson made 3,500,000 feet of gas at 1,715-19 feet. Phillips Petroleum Co.'s No. 1 Burke made 5 bbls. of oil at 2,059-65 feet.

PHILLIPS BUILDS NEW PLANT IN PANHANDLE

(Continued from Page 196)

not here so important because Phillips company controls an immense supply of water in that area.

Two More Plants

Two other new plants and the enlargement of an already existing plant in the Panhandle area, are also on the Phillips construction program. These plants were necessitated by insistent demand on the part of oil producers to utilize the gas being produced from their wells, as a part of general conservation plans.

The plant being enlarged is the Pampa plant, in Section 82, Block B-2, Gray County, in the heart of the new high-gravity Bowers oil pool. The present plant has been in operation only a short time, but additional drilling in that field by various operators and the consequent increase in gas volume has made it necessary to enlarge the plant to double its original size. The new unit, now nearly complete, is an exact duplicate of the present plant, but is installed as a separate unit. The combined capacities of the two will be 30,000 gallons daily.

The gasoline situation in this pool is slightly different from the others the company is operating in the Panhandle area. The oil is sweet and of high gravity, making it very desirable for refining purposes. The gas accompanying the oil is also sweet.

The present Pampa plant has incorporated in it some of the newest developments in gasoline plant design and operation. It has 17 engines which pull vacuum and discharge the gas at 35 pounds pressure through the plant proper. The engine room is of usual design and has in addition, auxiliary electric power. The distillation unit and cooling tower are of very late design and Phillips engineers feel they are more economical than any used to date. The cooling tower is built of California redwood with special admiralty metal coils which cool oil, gas and gasoline. The distillation unit was factory built according to Phillips engineers' specifications and is completely portable. Bubble type absorbers and stills are used and a direct water-cooling dephlegmator has been installed for the first time by the Phillips company in this plant.

Sanford Plant

The new Sanford plant, located in Section 82, Block 46, H.&T.C.Ry. Survey, Hutchinson County, will be operating about June 1, and will handle approximately 20,000,000 feet of gas daily, partly under well pressure and partly from the discharge of the compressors. The plant will operate on a low pressure basis, the gas being taken under vacuum and discharged at 15 pounds pressure, thereby largely increasing the amount of gas utilized per horsepower of machinery installed. Cooling towers, coils and distillation systems will be of usual design and construction. This plant is located at the railway terminal of the fuel and gasoline lines from the Phillips refinery, so the same operators can load gasoline from both the Sanford plant and the refinery at the same time, effecting a saving in both operating expense and capital expenditures. This plant will serve the entire Sanford area, one of much promise and size.

The third plant to be constructed will be known as the Texroy plant and will be located in Section 4, Block B-3, D.S.E. R.R.Co. Survey, Hutchinson County, in the midst of the McIlroy Pool. This plant will be similar to the Sanford plant except that it will be twice the size and will handle twice the volume of gas.

WARNER-QUINLAN BUYS CRANE COUNTY CRUDE

The Warner-Quinlan Co., one of the oldest of the independent refineries in the east coast area, during the past week purchased its first producing properties in the University Pool of Crane County, Texas. The properties purchased consist of two 80-acre tracts and one 160-acre tract.

The total consideration involved was $3,000,000. Approximately 2,000,000 bbls. of stored oil are involved with a current production of 6,000 bbls. daily from 24 wells. It is understood that the crude oil will be shipped by tank car or pipe line to the Gulf Coast and there taken by boat to the company's refinery located at Warners, N. J.

The smaller coastal refineries, as well as the large plants, are using more and more crude oil from the West Texas fields. The large companies have the advantage in that in most cases they have pipe line facilities to the coast. Some of the other companies, however, have found that a combination tank car and tanker shipment is feasible.

SHIPPING NEW CRUDE SUPPLY TO STANDARD

HOUSTON, Tex., May 5.—The Gulf Refining Co. of Louisiana the past week started to move crude out of its new Sorrento Dome Field, Ascension Parish, Louisiana, to the refinery of the Standard Oil Co. of Louisiana at Baton Rouge, La.

The oil, which has been held in an earthen reservoir at the field, is being pumped through a 4-inch line a distance of 1½ miles to loading racks, just completed at McElroy on the Louisiana Railway and Navigation Co. railroad. The refinery is about 25 miles northeast of McElroy on the same line.

The present production of the field is shut in, the oil in the reservoir being that produced by the discovery well up to a month ago. Gulf is holding off flowing any more oil into the reservoir pending the completion of additional wells to determine the extent of the field and the feasibility of building storage and docks on the Mississippi River, 7 miles distant, for barging the oil.

Industry Should Foster Air Travel

Head of Standard of Indiana Sales Confident That Airplane Will Rapidly Become Major Consumer of Petroleum Products

By C. O. Willson

CHICAGO, May 5.—As an assured large consumer of its products in the future, the oil business should give all possible aid in the development of air travel.

The wider use of airplanes is largely a matter of educating the public as to their advantages and oil companies are particularly well situated to aid in this educational work.

Allan Jackson, vice president of the Standard Oil Co. of Indiana thus summarizes the outlook for aeronautics and its relation to the oil industry. As is generally known, Mr. Jackson who heads the sales activities of the Indiana Standard has been a pioneer in promoting the use of airplanes in the oil industry.

During the past year his company has had in almost constant use a large airplane, "Stanolind," which was purchased from the Stout Metal Aircraft Division of the Ford Motor Co. Mr. Jackson was largely responsible for the purchase of the plane and his enthusiasm for air travel has now spread to include all the officers and directors of the company. The directors the first seven months flew over 38,000 miles carrying on company business. This is approximately the distance traveled by Lindbergh's "Spirit of St. Louis" over a period of a year.

Colonel Stewart's View

Col. Robert W. Stewart, chairman of the board of directors of the company, who also is an enthusiastic airman, explains the company's attitude as follows:

"This airplane was purchased primarily to furnish safe, fast and comfortable transportation when making long distance inspection trips to oil-producing regions, division headquarters or outlying refineries. Since the airplane flies in a straight line at a speed of approximately three times that of the fastest express train the saving of time more than compensates for the expense of operation and makes the airplane an economical method of travel.

"Since the airplane is equipped with three motors and will fly fully loaded with any two of them the element of danger from forced landings has been practically eliminated and travel by air is now as safe and comfortable as traveling on a transcontinental train.

"The Standard Oil Co. of Indiana is also very much interested in the encouragement of commercial aviation since we believe this to be one of the coming forms of transportation in this country. The company has already outlined and put in effect an immense program of marking airway designations on the roofs of its warehouses in order to aid flyers in navigating over unknown territories."

This statement reflects the position of the Indiana Standard in regard to aircraft. The company's experience with one plane over a period of 12 months has convinced the management that travel by air has real commercial possibilities and it therefore behooves the company to see that adequate motor fuel and motor lubricant service is furnished flyers in the Middle Western States in which it operates.

Pilots Plane

Discussing the future of aviation at his office here it was apparent that Mr. Jackson is more than just a supporter of the relatively new method of travel. He is a "fan." He would rather travel by plane than any other method. The element of hazard has been completely removed from his thoughts, his attitude being that he "feels much safer in our plane than I do riding in a car down Michigan Avenue." He has piloted the "Stanolind" in excess of 1,000 miles. He is yet to take off or land the plane but expects to do both in the near future.

At the time of the interview, Mr. Jackson had just returned from taking part in an air tour of Kansas points. A party headed by Governor Paulen in several planes of all types made a tour of Kansas in order to bring about a greater interest in the building of air ports by cities and towns.

For business reasons, Mr. Jackson was

ALLAN JACKSON
Vice president of the Standard Oil Co. of Indiana.

compelled to leave the company plane in Kansas before the tour was completed and return to this city. Traveling by trains, 18 hours were required to make the return trip. As indicating what the airplane means in travel, he pointed out that the return trip to Chicago could easily have been made by plane in five or six hours.

This saving in time is the one outstanding advantage which the airplane has over all other methods of travel and which assures the new industry a steady growth, according to Mr. Jackson. It is the one feature which has had a special appeal to the directors of the Standard company. For years it has been a fixed policy of the Standard directors to inspect all the properties of the company at regular intervals.

During the past few months with the large Ford plane carrying a maximum of eight passengers many of these trips have been made in a fraction of the time formerly required. In this connection Mr. Jackson, who keeps in close touch with new developments in airplane design, says that the planes of the near future will have greater speed. This applies to the large planes as well as the smaller type. For instance, Mr. Jackson predicts that in the near future a large plane such as the Stanolind will have a flying speed of 150 miles an hour. The average speed at present is from 85 to 100 miles an hour. This greater speed will be obtained without any sacrifice in safety and will greatly add to its attractiveness for commercial use.

The airplane today, Mr. Jackson says, is where the automobile was 25 or 30 years ago. Great advancement has been made in the design of the several type planes but with general interest now aroused progress in the perfection of aircraft will be much more rapid in the future. Mr. Jackson confidently awaits developments which will result in the airplane being generally utilized for all kinds of transportation.

For the immediate future, Mr. Jackson says airplane travel can be fostered in three ways and in these developments the oil industry can greatly aid those who are directly responsible for the growth of aeronautics.

Air Transport Service

The first of these is the development of air transport service. This applies to commercial air lines carrying passengers and freight and includes the government mail service. Mr. Jackson's information is to the effect that this air transport service will develop very rapidly this summer and fall provided it is given sufficient support by the public. Substantial business organizations who are familiar with transportation problems have become interested in the possibilities of this new service and are willing to finance its expansion in line with the support accorded it by the public.

In Mr. Jackson's opinion the time is not far distant when this air transport service will be used by the major railroads to supplement rail transportation. The demand for speed on the part of the business world will compel the railroads to use the air as well as the rails. Rail travel by night and air travel by day in transcontinental transportation has been suggested as a logical development at this time.

Although the cost per mile per person for this air transport service exceeds other types of transportation, Mr. Jackson points out that, if executives of oil companies and other business organizations will investigate, they will find that due to the saving in time, air travel will in many cases be more economical than the older and slower methods. This saving in time for executives and other company employes holding responsible positions for which they are paid high salaries, will more than offset the increased transportation costs.

Privately-Owned Planes

This feature of transcontinental service also points the way to another large potential use of the airplane. This applies to the company-owned planes for private business. Major companies in all lines of business will shortly find it expedient to have one or more planes in service to expedite carrying on of company business, Mr. Jackson predicts. He believes that the experience of his own company which has recently added a second plane, will be general. Time is more and more a controlling factor in modern business and the airplane is the logical solution to this problem.

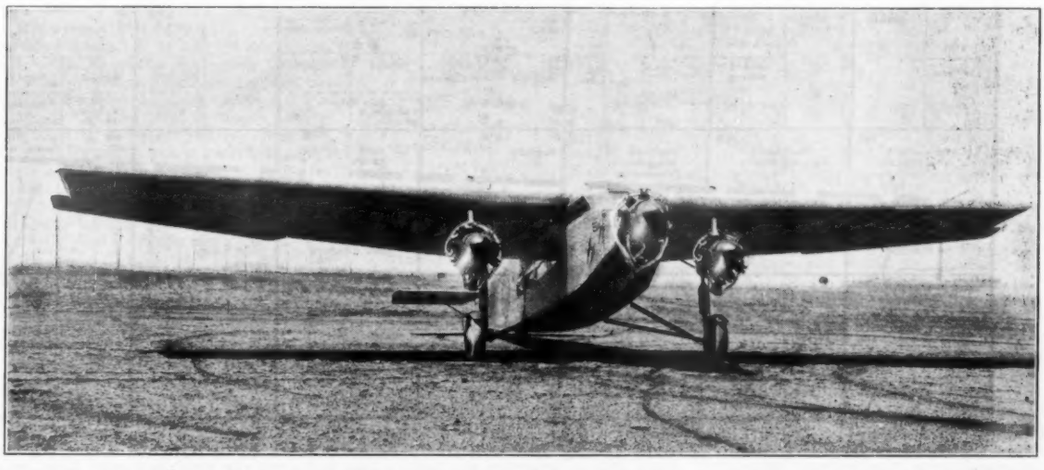
Companies operating over a wide area with many branch offices are finding the airplane an important aid in their business. The general office can more readily keep in touch with the branch offices to the advantage of all concerned.

Becoming Air Minded

A third outlet for airplanes at this time covers a wealthy class who can afford to own a plane for pleasure purposes. In Mr. Jackson's opinion there are at this time thousands of wealthy people who will enjoy owning a plane once they have been convinced of its safety. The problem here is to get these prospective users "air minded." He cites several cases of his own observation in which individuals became enthusiastic owners of planes after a ride or two in a plane.

The case of M. C. Meigs, publisher of the Chicago Herald-Examiner, is typical. The publisher became greatly interested in aviation after he had been persuaded to take one trip in the "Stanolind." He then asked to have the editors of his paper taken on a trip so that they also became air minded. The publisher now owns his own plane which he is learning to pilot.

Mr. Jackson is confident that the time has arrived when this pleasure use of airplanes will spread rapidly. Motoring



Standard Oil Co. of Indiana plane "Stanolind" with which the officers of the company flew 38,000 miles in seven months.

has lost much of its former zest for thousands of people who are looking for new means of travel. The airplane offers all the comforts of the automobile with the additional factors of speed and novelty.

How to Aid

The oil men of the country can hasten this expansion in many ways. More and better air ports are a great need at this time, Mr. Jackson says. Oil men should see that the communities in which they live have satisfactory accommodations for air travel. The Standard Oil Co. of Indiana now has suitable gasoline and lubricating oil service at over 4,000 bulk stations in the states in which it operates.

Mr. Jackson's final caution is for the refiners and marketers not to expect too much business from the airplane at this time. The planes in mail service used only 20,000 bbls of motor fuel last year. Airplane manufacture will probably increase 300 or 400 per cent this year over last. However, a relatively small refinery properly equipped could furnish all the gasoline and lub oils needed by airplanes this year. The real benefit to the oil industry will come in a few years when air travel has become more general.

WEST TEXAS FIELDS

(Continued from Page 48)

No. 1 Settles was a failure at 3,504 feet and was plugged back and made 280 bbls. from 1,298-1,319 feet. Magnolia Petroleum Co.'s No. 3 Dora Roberts, NE cor. W half, Section 34, Block 117, swabbed and flowed 72 bbls. per hour from pay at 2,987-98 feet and 3,016-20 feet and is now shut in.

Pecos County

California Co.'s No. 2 M. A. Smith, Lease 1, topped the pay at 1,580 feet and bottomed at 1,652 feet. The hole was plugged back to 1,632 feet and the well is flowing 30 bbls. per hour and no water showing.

Winkler County

Atlantic Oil Producing Co.'s No. 7 Grisham-Hunter, NE SE E half SW, Section 34, Block B-5, is making 85 bbls. per hour from pay at 2,895-3,040 feet. Same company's No. 8, SE NE E half SW, same section, is flowing at the rate of 70 bbls. per hour from pay at 2,990-3,038 feet. Atlantic company's No. 5 Ida Hendricks-D, SW SE S half, Section 29, Block B-5, had an initial production of 9,500 bbls., 5 per cent water, from pay at 2,924-27 feet. Atlantic company's No. 6-D, on the same lease, and in the SE cor. SW S half NW, made 8,000 bbls. initially, 5 per cent water and b.s., from pay at 2,925-35 feet. Atlantic and Collett's No. 4-F Hendrick, NE cor. NW, Section 40, Block 26, is making 80 bbls. per hour from pay at 2,650-2,750 feet.

Humble Oil & Refining Co.'s No. 8 Grisham-Hunter, SW NW NE, Section 34, Block B 5, is making 75 bbls. per hour, 75 per cent water, from pay at 2,875-2,915 feet. Same company's No. 12 Grisham-Hunter, SE SW NE, Section 34, Block B-5, started off making 500 bbls. per hour, 40 per cent water, from pay at 2,945-50 feet.

Magnolia Petroleum Co.'s No. 3 Ida Hendricks, SE NW SE, Section 29, Block B-5, was completed in pay at 2,762-2,900 feet making 600 bbls., 5 per cent b.s. and water. Same company's No. 5 Ida Hendricks, NW SW NE, Section 29, Block B-5, was drilled to a total depth of 3,188 feet; plugged back to 3,146 feet and completed making 100 bbls., 65 per cent water and b.s. from pay at 2,830-3,146 feet. Roxana Petroleum Corp. and Llano's No. 2 Scarborough, SW cor. NE, Section 1, Block C-22, School Land, made 69 bbls. in 11 hours on the pump from pay at 3,108-3,300 feet.

WEST TEXAS
Estimated Daily Average Production for the Week Ending May 5

Crane County	60,949
Crockett County	2,775
Ector County	12
Fisher County	215
Howard County	4,129
Jones County	1,347
Loving County	115
Mitchell County	2,996
Pecos County	50,167
Reagan County	18,801
Runnells County	129
Scurry County	36
Upton County	11,647
Winkler County	253,000
Total this week	406,318
Total last week	371,824
Increase	34,494

WEST TEXAS
Daily Average Production by Leases for the Week Ending May 5
Crane County
(Church & Fields Pool)

Company and Lease—	Wells	Bbls.
Church et al:		
University	1	50
Church & Weekley:		
University	3	864
Church & Fields:		
Duval-University	1	*50
Eastland Oil & Collett:		
University	8	2,830
Gulf Production Co.:		
All leases	68	16,552
Humble Oil & Ref. Co.:		
University	13	3,769
Independent Oil & Gas Co.:		
University-A	5	*890
University-B	2	*723
Landreth Prod. Corp.:		
Cowden-Anderson	16	7,815
Magnolia Pet. Co.:		
University-Hardwicke	14	2,135
University-O'Keefe	12	1,655
State-Lasseter	3	133
Magnolia et al:		
University	4	47
Pecos Oil Co.:		
University	16	2,706
Prairie Oil & Gas Co.:		
University	5	508
State-Lasseter	7	*7,022
Simms & Atlantic:		
University-A	9	*1,393
University-B	1	50
University-C	8	*2,901
University-D	12	*3,105
University-E	1	150
Stidham & Thrasher:		
University	1	3
The Texas Company:		
University	1	190
University-Beasley	1	0
Tidal Oil Co. et al:		
University-B	2	54
University-C	1	28
University-E	1	72
University-F	8	*1,616
University-G	3	101
University-H	2	20
University-I	8	*2,818
Total Church & Fields Pool	237	60,292

Miscellaneous Crane County

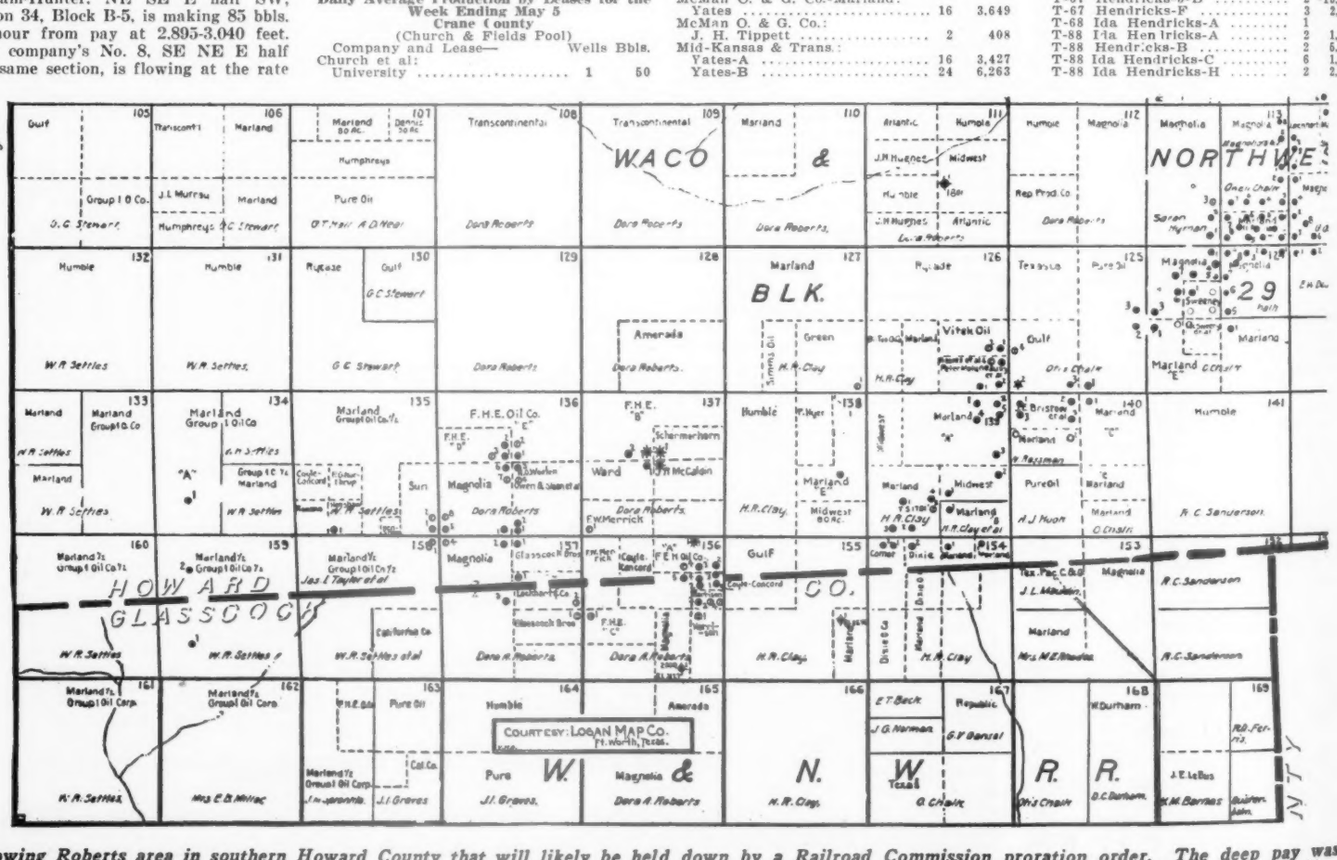
Gulf Production Co.:		
Waddell	1	25
McMan Oil & Gas Co.:		
Hughes	2	60
Marland Oil Co.:		
All leases	14	397
The Texas Company:		
King	9	175
Union Land Co.-F	1	0
Total	27	657
Grand total Crane County	263	60,949

Pecos County

California Oil Co.:		
Yates, Lease 1	15	3,770
Smith, Lease 1	1	117
Smith, Lease 3	12	3,558
Gulf Prod. Co.:		
All leases	11	6,175
Humble Oil & Gas Co.:		
M. A. Smith	7	2,345
M. A. Smith-B	4	1,434
Kirby Pet. Co.:		
J. H. Tippett	1	74
Kirby Pet. Co. and Edson:		
J. H. Tippett	1	139
Marland Oil Co.:		
Yates-A	10	997
Maxda & Savoy Oil Co.:		
M. A. Smith	1	300
McMan O. & G. Co.-Marland:		
Yates	16	3,649
J. H. Tippett	2	408
Mid-Kansas & Trans.:		
Yates-A	16	3,427
Yates-B	24	6,263
Yates-C	8	3,158
Yates-D	2	866
Yates-E	1	102
Yates-F	1	362
Yates-G	1	6
Smith	2	66
Smith-Taylor	14	4,545
Oil Operators Trust Corp.:		
Pecos River Bed	7	744
Phillips Pet. Co.:		
Smith	1	106
Red Bank Oil Co.:		
Smith	2	515
Roxana Pet. Corp.:		
Tippett	7	3,496
Smith	5	1,192
Skelly Oil Co.:		
Tippett	1	113
Simms Oil Co.:		
Smith	6	3,262
Texon Oil & Land Co.:		
Yates	2	6
Total Yates Field	181	50,167

Winkler County

Atlantic O. P. Co.:		
Grisham-Hunter	8	8,646
Grisham-Hunter-E	2	4,144
Ida Hendricks	1	287
Ida Hendricks-D	5	*11,620
Atlantic & Collett:		
Ida Hendricks-F	3	21,845
California Co.:		
Ida Hendricks	8	5,100
Cranfill & Reynolds:		
Ida Hendricks	1	600
Grisham-Hunter-B	1	133
Hendricks-C	2	19,703
Gulf Prod. Co.:		
T. G. Hendricks	11	18,775
Humble Oil & Ref. Co.:		
Grisham-Hunter	9	*22,300
Ida Hendricks-B	6	5,972
T. G. Hendricks-C	1	13,668
Independent Oil & Gas:		
E. W. Cowden	1	200
Grisham-Hunter	8	*7,676
Grisham-Hunter-B	4	5,288
Hendricks	1	27
Ida Hendricks-A	1	366
Landreth Prod. Corp.:		
Grisham-Hunter	2	5,995
Ida Hendricks-A	5	4,760
Magnolia Pet. Co.:		
Ida Hendricks	6	2,594
Murchison & Cranfill Bros.:		
Grisham-Hunter	2	112
Grisham-Hunter-C	1	72
Grisham-Hunter-B	2	704
Pure Oil Co.:		
Grisham-Hunter	5	3,675
Grisham-Hunter-B	4	3,355
Republic Prod. Co.:		
Grisham-Hunter-A	2	*8,125
Grisham-Hunter-B	3	2,620
Roxana Pet. Corp.-Llano:		
Scarborough	2	39
Roxana Pet. Corp.:		
Grisham-Hunter-A	2	*10,462
Grisham-Hunter-D	4	3,870
Grisham-Hunter-E	1	1,500
Ida Hendricks-B	4	4,686
Ida Hendricks-C	8	*14,216
Southern Crude Co.:		
T-67 Hendricks-A	2	258
T-67 Hendricks-C	5	1,072
T-67 Hendricks-B	2	689
T-67 Hendricks-3-B	2	*15,867
T-67 Hendricks-F	3	2,386
T-68 Ida Hendricks-A	1	0
T-88 Ida Hendricks-A	2	1,233
T-88 Hendricks-B	2	5,437
T-88 Ida Hendricks-C	6	1,955
T-88 Ida Hendricks-H	2	2,626



Showing Roberts area in southern Howard County that will likely be held down by a Railroad Commission proration order. The deep pay was discovered in Section 136, Block 29. Deep pay production has been extended until the pool is a mile long at present. It is estimated that the deep pay zone is capable of reaching a peak of between 100,000 bbls. and 125,000 bbls. The chalk field is to the northeast and the Settles Pool is to the southwest of the Roberts Pool. Four pay zones are found in southern Howard County.

T. S. Ida Hendricks-I	1	1,120
Texon Oil & Land Co.:		
Grisham-Hunter-A	2	*4,339
Grisham-Hunter-B	2	2,754
Total Winkler County	159	253,000

*Pinched in.

Overthrusting of Rocks in Various Parts of the World

"Overthrusting" was the subject of five papers presented before the Tulsa Geological Society Monday night, May 7th.

Charles Ryniker of the Gypsy Oil Co., had as his subject "The Alps." He dealt with the orogeny of structural history of the Alps very thoroughly showing that they were formed by a series of overthrusts from the south and southeast, the resultant group of great folds and faults then being compressed still more intensely and accompanied by magmatic intrusion. The development was well illustrated by slides.

Appalachian and Ozarks

K. K. Kimball of the Burr Gibbons Co. spoke of his studies in the Appalachian Mountains of central Virginia. Kimball believes the conditions found in the Appalachians are applicable to the Ouachita area of southeastern Oklahoma, that they may have undergone a somewhat similar history. Thus the Appalachians were once in a condition of simple vertical thrust or uplift as the Ozarks are now and then subsided. This subsidence developed stresses which produced overthrusting.

Similarly considering the Ouachitas, the speaker said, it may be conceived that the ancient land area of Llanoria of eastern Texas, southeastern Oklahoma, northern Louisiana and southwestern Arkansas subsided and caused stresses which produced the Ouachita overthrust.

Overthrusting in Montana

Robert Roth of the Atlantic Oil Producing Co. spoke briefly on "The Lewis Overthrust of Glacier National Park, Montana." He showed kodak views of older formations overlying younger ones. An interesting proof of the overthrust, which extends into Canada, was furnished by a well in the Waterton Lakes region of Canada, just across the line, where the bit went from older formations into the Cretaceous within 1,000 feet.

Ira Cram of the Pure Oil Co. gave a short discussion of the "Marathon Overthrust" of southwest Texas and the problems it offers. He had communicated with Charles Baker, formerly of the University of Texas, who has done some studying in the region.

Cram believes it barely possible that some sediments corresponding to the Simpson of Oklahoma may be represented there. However, the early Paleozoic rocks are intensely deformed, resulting in much of the section being sheared out and badly crumpled. Hundreds and possibly thousands of feet may have been thrust out.

Thus, the hiatus found at the Choctaw fault in southeastern Oklahoma and in the Marathon district of Texas may be due to the bringing together of sediments originally miles apart, he said.

Ouachita Mountains

The last talk was by Wesley Gish, chief geologist of the Sinclair Oil and Gas Co., on the Ouachita Mountains of Arkansas and Oklahoma. Rocks ranging in age from the Cambrian to the Pottsville of the Pennsylvanian have been thrust to the north and northwest from the south and southeast, Mr. Gish said. The folds in Arkansas are generally insoclinal while those in Oklahoma are open and symmetrical. There are four great faults, the two largest being the Winding Stair and Choctaw faults. Miser found important evidence of low angle overthrusting in a geological "window" just east of the town of Talihina, Okla. This fault surface is known for a distance of six miles. The Ouachita sediments have been shoved almost to the Arbuckle Mountains, apparently over rocks of Arbuckle facies, for a distance of 20 miles at least.

The Ouachita thrusting produced sharp, steep folds close in on the west side of the Choctaw fault. Further out to the northwest they are much gentler. Apparently the Cushing Ridge, the Nemaha Ridge and lesser associated ridges in the basement rocks acted as buttresses to the stresses from the southeast and produced the folding of central and southeastern Oklahoma northwest of the Choctaw fault.

Late Field News

(Continued from Page 46)

274,225 bbls. from 1,089 wells for the 24 hours ending Tuesday morning at 7 a. m. The production by pools was:

	Bbls.
Little River	43,182
Bowlegs	67,869
Earlsboro	95,161
Seminole	52,543
Searight	15,470
Total	274,225

The Carter Oil Co.'s No. 1 Wilson, SW cor. SW, Section 12-7-6, the north offset to the Snowden & McSweeney well is in the Simpson sand 4,206-4,209 feet, and made one flow of 60 bbls. The Sinclair Oil & Gas Co.'s No. 1 Tewee, NW cor. SW NE, Section 14-7-6, is flowing 3,285 bbls. daily. The sand on this well was 4,178-83 feet.

The following wells south of the Little River Pool in Township 7-6, have been pinched in under the Seminole operators' agreement: Gypsy Oil Co.'s Denmark, Section 11-7-6; Gypsy Oil Co.'s Hulhoke, Section 14-7-6; Mid-Continent Petroleum Corp.'s Bruner, Section 11-7-6; Reiter-Foster Oil Co.'s Bunyard, Section 14-7-6; Sinclair Oil & Gas Co.'s Tewee, Section 14-7-6; Independent & Texas' Holutka, Section 23-7-6; Independent Oil & Gas Co.'s Nos. 1 and 5 Harris, Section 23-7-6, and Snowden & McSweeney's No. 1 Tiger, Section 13-7-6.

GULF COAST

Gulf Production Co. completed its No. 11-B Blakely in Blue Ridge, Fort Bend County, Monday, and it is flowing 2 500 bbls. of pipe line oil daily from sand at 3,804 feet. Watts Brothers' No. 1 Scott, which extended Blue Ridge 500 feet northwest two weeks ago, making initially 1.850 bbls., stopped flowing and is to be put on the pump.

Gulf Production Co.'s No. 7 Trone, Long Point wildcat, in Fort Bend County, has been abandoned, drilling 10 feet into cap rock topped at 3.112 feet. This company has abandoned its No. 6 Sanborn, Hawkinsville, Matagorda County, in salt at a total depth of 786 feet. Its No. 5 Bordages, Fannette, Jefferson County, has been abandoned at 1,995 feet.

Gulf's No. 3 Perry, Stratton Ridge, Brazoria County, has been abandoned in sticky shale at 5,839 feet.

At Jennings, Acadia Parish, Louisiana, Yount Lee Oil Co. has abandoned No 3 Housierre-Latrielle in cap rock at 4,602 feet.

CENTRAL AND WEST TEXAS

Hendricks, Winkler County, production on May 7 was cut to 143.695 bbls. from 164 wells. Republic Production Co. produced 13.866 bbls. yesterday and has not pinched its wells in as yet.

W. T. Daniels' No. 1 Moody, southeast part of J. Scott Survey No. 665, Coleman County, has a hole full of oil from 1,840-43 feet and is shut down for storage.

A quarter of a mile northwest of the discovery well in the Eubanks Pool in Brown County, Bradstreet's No. 1 Eubanks made 31 bbls. the first hour and 20 bbls. the second hour from sand at 1,210 37 feet.

INDIA'S OIL INQUIRY

The tariff board which has been ordered by the Indian government to make an inquiry into the Indian petroleum position is to report before July 1. According to the terms of reference, the board is to determine the world parity price at Indian ports and the extent to which current prices in India are below it; whether the national interest requires protection against dumping, and, if so, in what form and for how long; and whether the price war is likely to extend to petrol, and, if so, what would be the consequences and what measures should be taken.

TEXAS, LOUISIANA, ARKANSAS STORAGE

HOUSTON, Tex., May 7.—Crude storage in Texas, Louisiana and Arkansas totaled 116,119,713 bbls. on April 1, according to figures just compiled here. This was an increase of 2,449,284 bbls. The gain in stocks during March as in previous months was due largely to West Texas. The increase in West Texas amounted to 2,871,109 bbls.

Gulf Coast and Southwest Texas fields and Louisiana reflected decreases in storage while increases were made in all other districts.

Crude storage on April 1 was:

Texas

Northern District—	Steel	Earthen
Eastland-Stephens area	8,959,956	.....
North Texas	4,682,847	.....
Powell	2,451,021	.....
Mexia district	7,794,545	.....
Panhandle	18,335,834	.....
West Texas	21,079,884	.....
Total April 1	63,304,087	.....
Total March 1	60,349,774	.....
Increase	2,954,313	.....
Gulf Coast and Southwest Texas—		
Boling	36,520	.....
Batson	2,610	.....
Big Creek	89,330	.....
Damon Mound	6,650	.....
Dayton	4,000	.....
Barbers Hill	1,200	.....
Goose Creek	158,314	115,800
Hull	241,977	.....
Humble	1,120,788	1,185,650
Lockport (Lytton Springs)	15,263	.....
Luling	417,973	.....
Liberty	42,050	.....
Markham	12,491	.....
Orange	109,333	.....
Pierce Junction	40,000	.....
Saratoga	235,126	.....
Spindletop	4,453,594	175,000
Sour Lake	1,391,935	620,365
West Columbia	1,220,220	994,530
Laredo	1,667,868	.....
Total April 1	11,267,232	3,091,345
Total March 1	11,811,330	3,152,083
Decrease	544,098	60,738
Miscellaneous (refinery tank farms and terminals)—		
Englewood	1,140,723	.....
Norsworthy	538,171	.....
Sinco	685,600	.....
Webster	1,846,841	.....
Texas City	2,600,000	.....
Lynchburg	150,200	.....
Baytown	2,204,335	.....
Pasadena	.....	.....
Crosby	173,070	.....
Almeda	90,000	.....
Total April 1	9,428,940	.....
Total March 1	9,271,753	.....
Increase	157,187	.....
Total Tex., Apr. 1	84,000,259	3,091,345
Total Texas, Mar. 1	81,432,857	3,152,083
Difference	2,567,402	60,738

Louisiana

Northern District—	Steel	Earthen
Shreveport district	2,715,099	.....
DeSoto	906,131	.....
Bull Bayou-Crichton	31,279	.....
Urania	79,769	.....
Cotton Valley	237,593	.....
Homer	3,648,953	.....
Haynesville	4,204,486	.....
Bellevue	196,665	.....
Total April 1	12,020,075	.....
Total March 1	12,064,989	.....
Decrease	44,914	.....
Gulf Coast—		
Sorrento	.....	50,000
Edgerly	15,200	.....
Evangeline	47,742	.....
Vinton	4,786	.....
Lockport	607,198	.....
Total April 1	674,926	50,000
Total March 1	896,126	50,000
Decrease	221,200	.....
Total La. April 1	12,695,001	50,000
Total La. March 1	12,961,115	50,000
Decrease	266,114	.....

Arkansas*

	Steel	Earthen
El Dorado & Lisbon	2,149,032	.....
Smackover	13,820,735	.....
Nevada County	313,341	.....
Total April 1	16,283,108	.....
Total March 1	16,074,374	.....
Increase	208,734	.....

Summary

	April	March
North, Central and West Texas	63,304,087	60,349,774
Coastal and Southwest Steel	11,267,232	11,811,330
Earthen	3,091,345	3,152,083
Miscellaneous, Texas	9,428,940	9,271,753
Louisiana:		
Steel	12,695,001	12,961,115
Earthen	50,000	50,000
Arkansas	16,283,108	16,074,374
Total	116,119,713	113,670,429
Increase	2,449,284	.....

*Steel and earthen storage combined.

TEN YEARS' NATURAL GAS SUPPLY FOR NEW ORLEANS

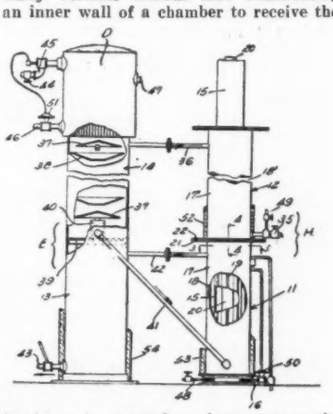
SHREVEPORT, La., Apr. 7.—Sufficient gas can be piped to New Orleans from the Monroe Field to supply the city for the next 10 years, says a report submitted to the New Orleans City Council by engineers employed to make an inquiry as to available sources and probable length of service of such sources of fuel preparatory to action on a franchise to supply gas to the city. This, however, the report states, is predicated on existing pipe lines and the understanding that the supply to industrial consumers would be curtailed or cut off altogether in times of extreme cold weather when domestic consumption is correspondingly greater. The report also contemplates a consumption of 35,000,000 feet per day of natural gas to be mixed with the 15,000,000 feet of artificial gas now supplied.

Meanwhile, injunction proceedings instituted by New Orleans Public Service, Inc., against the city restraining it from interfering with construction of distributing system and pipe line from the company's artificial plant to the city limits to connect with Interstate Pine Line Co.'s line from the Monroe Field, have resulted in a decision for the city. Public Service, Inc., has stopped all work and it is indicated that the company will take no further legal action. The city of New Orleans advertised recently for bidders on a franchise to supply natural gas to New Orleans consumers.

Recent Patent

1,664,920. Fire Still and Oil Treater. Forrest E. Gilmore, Los Angeles, Calif., assignor to Forrest E. Gilmore Co., Portland, Ore., a corporation of Delaware. Filed February 4, 1926. Serial No. 85,852. 7 Claims. (Cl. 196-117).

1. In a fluid heating and separating organization of the general character described; a heater comprising a substantially vertical central flue constituting an inner wall of a chamber to receive the



liquid to be treated; a burner near the bottom of said flue; means for introducing said liquid near the bottom of said chamber; and means for conducting the heated liquid from said chamber, at a higher level, to an associated evaporator, said inner wall being provided with outwardly projecting fins, radially disposed in vertical planes to facilitate heat exchange.

SWAN-FINCH DIVIDEND

Swan-Finch Oil Corp. declared regular quarterly dividend of 1¾ per cent on preferred ($25 par), payable June 1 to stockholders of record May 10.

EASTERN ENGINEERS WILL MEET MAY 17-18

(Continued from Page 39)

a day. This is twice as much as the State produced in 1923. New York from 1882 to 1927, both inclusive, produced a total of 65,713,000 bbls., or an average of less than 4,000 bbls. per day over the entire period. After 46 years of intensive development the field is producing 2,500 bbls. a day more than its average for the previous 46 years. Flooding is nearly altogether responsible for this remarkable condition. It is on record that one lease in the Allegany Field which had averaged 3,500 bbls. per acre over a period of nearly 40 years by ordinary pumping methods produced 13,500 bbls. per acre after three years of flooding.

Production Laboratory

For the past several years the Bradford-Allegany district has been regarded as a production laboratory by the United States Bureau of Mines. The development of the two pools by flooding, by air and gas pressure artificially applied and by the use of soda ash as an aid in flooding, has been watched by oil executives, producers and scientific men in the industry all over the world. Bradford-Allegany is an outstanding example of what can be done in extracting oil from sands which cannot be operated at a profit by ordinary pumping methods.

The program of the coming meeting here will not be devoted exclusively to production methods in this region. Papers on deep well drilling in southern Pennsylvania and West Virginia and air pressure recovery in Eastern fields generally will be among those to be presented. sented.

The program follows:

May 17, 1928

10 a. m. "Water Flooding in the Bradford Field," by Forest D. Dorn, president, Forest Oil Corp., Bradford, Pa.

"Deep Well Drilling—Cable Tool Method, in Southern Pennsylvania and West Virginia," by J. French Robinson, geologist, Peoples Natural Gas Co., Pittsburgh, Pa.

"Deep Well Drilling—Cable Tool Method, in Northern Pennsylvania," by J. G. Montgomery, Jr., geologist, United Natural Gas Co., Oil City, Pa.

1:30 p. m. "Coring with Cable Tools," by R. T. Zook, Sloan & Zook Co., Bradford, Pa.

"Air Pressure Recovery in the Eastern Field," by R. M. Haskell, Associated Producers, Co., Bradford, Pa.

"Small Field Economies," by A. E. Booth, president, Northwestern Pennsylvania Oil Producers Association, Bradford, Pa.

"Some Geological Factors Influencing the Recovery of Oil by Flooding," by Paul D. Torrey, geologist, Northwestern Pennsylvania Oil Producers Association, Bradford, Pa.

7 p. m. Dinner and round table discussion.

8:15 p. m. Picture, "The Story of Petroleum," by the United States Bureau of Mines and the American Petroleum Institute.

May 18, 1928

9 a. m. Field trips to various points of interest, illustrating methods used in drilling, development and recovery in the Bradford Field.

STRONG DEMAND FOR OKLAHOMA GASOLINE

(Continued from Page 36)

months of this year the Mid-Continent refiners will run approximately 438,000 bbls. daily while over the same period last year they ran approximately 410,000 bbls. This is an increase of 28,000 bbls., but amounts to less than 6 per cent when figured on that basis. Consumption of refined oils is well above that figure.

Gasoline and Naphtha

There was a continued strengthening of all grades of gasoline and most refiners were anticipating fractionally higher prices within a few days. An effort was being made to establish a 7¼-cent price on the 58-60 437 endpoint grade with an advance of from one-eighth to one-quarter cent for the other grades. While the market for the higher endpoint gasolines is becoming a greater factor in the volume of material moved, the great bulk of the business is in the 58-60 U. S. Motor grade.

The weighted average prices on the more important refinery gasolines on covering sales made Monday, May 7, and Monday of the previous week as reported by Oklahoma refiners are shown below:

Grade—	Price— May 7	April 30
58-60 437 endpoint	.07106	.06940
60-62 437 endpoint	.07200	.06944
60-62 400 endpoint	.07271	.07000
64-66 375 endpoint	.07437	.07214

Naphtha prices were advanced one-quarter cent in most instances and this commodity is receiving more attention as gasoline prices are advanced. Blenders are taking an increasing amount of it because of the maintenance of a profitable margin between the refinery gasoline and natural gasoline prices.

Kerosene and Distillates

The kerosene market prices were generally from one-eighth to one-quarter cent above those of last week and while there was no extensive buying, refiners anticipate new advances. Several refiners have already established a 5⅝-cent quotation. Scattered cars are being offered at 5⅛ cents, but this is expected to be removed from the market within a few days.

Gas Oil and Fuel Oil

As gasoline prices continue to advance, gas oil becomes more attractive as a cracking stock and over the last week there was a strengthening in the price despite the weakening of fuel oil. With the 58-60 437 endpoint gasoline at 7¼ cents and the gas oil price 2⅝ cents a margin of 4⅝ cents exists between the two products and this is more than generally needed to pay the cost of cracking. The gas oil market has been slow to reflect the advancing gasoline market in the past because of the greater production of gas oil at refineries where crude runs have been increased.

There has been no corresponding increase in the cracking capacity and instead of refiners entering the spot market for charging stock they have chosen to supply their needs by increasing crude runs. There is a tendency for fuel oil prices to weaken as crude runs are increased and competition from the West Texas refiners is becoming increasingly keen. There is a surplus of fuel in the West Texas and Panhandle Fields that is finding its way into the mid-western states and although this fuel has a relatively high sulphur content and a high cold test it is being used in many large industries during the warmer weather when the cold test is of lesser importance. Stocks of fuel are relatively low however, and refiners are considering storing any production they can not move rather than sell at prices under the present market.

Lubricating Oils and Wax

The increased movement of lubricating oils is tending to strengthen the prices, but there is no thought of effecting a general advance. Cylinder stock and bright stock prices have shown on change and there is a free offering of each.

Wax is generally quoted at 2½ cents as the minimum and while strong resistance is met with each advance in price, there is confidence on the part of refiners that wax prices will show a gradual advance over the year.

DRILLING PROGRESS IN E. CENTRAL TEXAS

MEXIA, Tex., May 5.—With the exception of an abandoned test at 723 feet in Smith County no completions were reported from the East Central Texas area last week. The Humble Oil & Refining Co. cored a hard sand and anhydrite at 723 feet in No. 1 Birdsong, Chiles Survey, Smith County, and discontinued operations. The same company was building derrick for No. 1 Williams, Kellar Survey, Smith County. The Gulf Production Co.'s No. 2 McCammond, Moore Survey, Smith County, was drilling hard sandy lime at 1,526 feet.

In Anderson County the Humble Oil & Refining Co. was drilling hard chalk at 3,655 feet in No. 1 Mandelstram, Roberts Survey. Top of the Austin chalk was found at 3,590 feet.

In Camp County J. C. Rogers' No. 1 J. C. Boyd, Montgomery Survey, was shut down in sandy shale at 1,100 feet.

In Cherokee County Joe Watson's No. 1 Rucker, Reese Survey, was shut down in sand rock at 1,185 feet.

In Falls County Groesbeck & Chisholm's No. 1 Marlin National Bank found the top of the Georgetown lime at 2,402 feet and was drilling at 2,452 feet.

In Henderson County Heine & Smith and others set surface casing in No. 1 Fannie Cox, Brown Block 28.

In Limestone County the Pure Oil Co.'s No. 1 Henry Unfreid, Neill Survey, was drilling sandy shale at 2,791 feet. These was a salt water sand at 2,609-43 feet. Austin chalk was found from 1,914 to 2,291 feet. C. F. Lytle and others were drilling at 2,560 feet in No. 1 Thompson, Varella Survey, Reiter, Lewis and others' No. 1 Mrs. Ward, Varella Survey, was drilling at 700 feet. Yost and others were shut down at 1,650 feet in shale in No. 1 Poindexter, Flippen Block 17.

In Navarro County O'Byrne and others' were drilling chalk at 2,615 feet in No. 1 Hamilton, Rahm Survey.

CONSTRUCTION PROGRAM IN BAYOU BOUILLON

HOUSTON, Tex., May 7—Rycade Oil Corp. of this city has started an extensive construction program at its new field, Bayou Bouillon, St. Martin Parish, Louisiana. This will include the erection of loading docks and wharves, warehouse, office and quarters for the men, and the dredging of canals through the island on which the field is located.

Loading docks being built will accommodate three steamers and creosoted piling already is being driven in the bed of the Atchafalaya River for them. A combination two-story building will house the warehouse, offices and quarters for the men. On the first floor will be the warehouse and offices while living quarters for 50 men will be provided on the second floor.

As the field, being in a swamp, is subject to floods by overflows from the Atchafalaya River, the entire building and the wharves are to be erected on piling above the high water level.

A series of canals also are being dredged through the swamps of the island to permit transportation and movement of supplies and equipment by boats to the tests to be drilled. One dredge already is at work on this. Two large pile drivers are being used to drive piling for the other construction .

Rycade made location the past week for No. 1 State in Atchafalaya River and piling is being driven for the derrick. This test will be drilled in 30 feet of swift water. This will be the fourth test by Rycade. The discovery well, No. 2 Atchafalaya, brought in last March, and so far the only producer, is swabbing between 300 and 400 bbls. daily but is being rigged up to pump. Production still is being moved by barge to the Standard Oil Co. of Louisiana's refinery at Baton Rouge. Rycade has completed construction of 3,000 bbls. of storage facilities.

DEATH OF JAMES J. WOOD

James J. Wood, consulting engineer of the Fort Wayne Works of the General Electric Co., and one of the pioneers of electric lighting by arc lamps in America, died suddenly April 19, in Asheville, N. C., from heart disease. He had just passed his seventy-first birthday.

PRAIRIE P. L. SHIPMENTS

The Prairie Pipe Line Co.'s crude oil shipments in April were 4,901,433.44 bbls., an average of 163,381 bbls. per day. Shipments in March averaged 169,455 bbls. per day and in February 172,640 bbls. per day and in January, 174,029 bbls. per day.

Howard N. Cole, Pure Oil Executive, Dies After Long Illness

Howard Norton Cole, vice president and general manager of the southwestern producing division of the Pure Oil Co., died at his home in Tulsa, May 4, after an illness of several months. He had been confined to his home since January.

Mr. Cole had a high standing among oil men in the Mid-Continent and Gulf Coastal fields and the news of his death was received with profound regret.

H. N. Cole was born on a farm near Kinsman, Ohio, in 1874. He graduated from Kinsman High School, after which he attended the New Lynn school in Ohio to prepare himself for college. He graduated from Allegheny College in Meadville, Pa., where he made a notable record as an all around athlete. He took the engineering course in Allegheny and was employed first by the Wabash Railroad and later the Pennsylvania Railroad. Leaving railroad service Mr. Cole was placed in charge of the construction of the Mount Washington Tunnel in the city of Pittsburgh.

The Sun Oil Co. engaged Mr. Cole and

Howard N. Cole

sent him to Beaumont, Tex., and later put him in charge of its construction work in the Humble Field. He moved to Shreveport and then to Wichita Falls for the same company but while those cities were his headquarters his work was largely in the field where he achieved such success that the Sun Oil Co. sent him to Tulsa and placed him in charge of the operations of the Twin State Oil Co., a Sun subsidiary. This was in 1913 and five years later he accepted the position of vice president and general manager of the southwestern producing division of the Ohio Cities Gas Co., which later became the Pure Oil Co.

Under the direction of Mr. Cole the Pure Oil Co. became one of the outstanding oil producers in the Mid-Continent Field. His foresight in the purchase of leases is credited with having made huge profits for his company.

Mr. Cole was married in 1900 to Miss Bess Margaret Baker, whom he met while attending college, and who survives him. Other survivors are his father, Charles Cole, and one brother, Harmon Cole of Tulsa.

Mr. Cole was chairman of the Seminole Field shutdown committee for several months until ill health forced his retirement, and he was a member of the executive board of the Mid-Continent Oil & Gas Association and a director in the First National Bank of Tulsa.

Funeral services were held Saturday in the First Presbyterian Church in Tulsa under Masonic auspices and the body was taken to Meadville, Pa., for burial.

Consider what is behind THERMOID RELIABILITY

RELIABILITY

23 YEARS EXPERIENCE *in* BRAKE LINING

SOME THERMOID OIL FIELD PRODUCTS

Brake Lining
Rotary Drill Hose
Transmission Belts
Balata Valves
Stuffing Box Rings
Rubber Sleeves, etc.

BRAKE LINING

THERMOID RUBBER COMPANY - *Factories and Main Offices* - TRENTON, N. J.

Of Interest to Sales Departments

MORE FUEL OIL BEING USED BY NO. 1 RAILWAYS

The total cost of fuel oil and coal for locomotives used by Class 1 railways in February amounted to $29,227,664, as compared with $31,995,764 in the same month last year, according to the Interstate Commerce Commission. There was a decline from February of last year in the coal tonnage consumed, which fell off from 9,808,553 tons to 9,490,922 tons and in the average cost per net ton, including direct freight charges, from $2.70 to $2.56 a ton.

Consumption of fuel oil showed a gain from 182,315,767 gallons in February, 1927, to 188,061,555 gallons in February this year. There was a decrease in the average cost per gallon from 3.03 cents to 2.60 cents, including direct freight charges.

For the first two months of the current year, the cost of locomotive fuel, both coal and oil, totaled $60,163,564, as compared with $68,615,699 in the first two months of last year.

Consumption of fuel oil for the first two months of the year was 385,897,970 gallons, as compared with 392,378,793 gallons in the first two months of 1927. The average cost per gallon this year was 2.61 cents, against 3.01 cents in the corresponding period last year.

SHREVEPORT AIRPORT EQUIPPED WITH PUMP

SHREVEPORT, La., May 5—Crystal Oil Refining Corp. of this city has advanced the city's embryonic airport a great step forward by installing a gasoline pump for the convenience of ships landing here. Until the company installed the outfit for the man who has the servicing contract at Steere Field, pilots hopped to Mansfield, 40 miles south, to get their "gas" rather than wait for a tank wagon to come out and fuel their ships. They could make it to Mansfield, fuel, and be back in Shreveport before a tank wagon could arrive from the city.

The Crystal's installation is a "blind" pump mounted on a concrete base 2 or 3 feet high discharging into a buried pipe extending 65 feet from the pump to a concrete box 3 feet by 4 feet built flush with the surface and containing 36 feet of hose such as used on pumps in ordinary filling station practice and on tank wagons, one end of which is permanently connected to the pipe. With such installation planes may taxi into position for fueling without having to be rolled back by hand after coming to a stop on landing.

Equipment has been in place only a short time, but pilots using the field have passed many approving expressions in that time.

WANT GASOLINE TAX USED FOR MORE ROADS

SHREVEPORT, La., May 5.—Reduction of the motor vehicle tax in Louisiana and diversion of more of the revenues from this source and from the gasoline tax to construction and maintenance of good roads will be sought from the forthcoming Louisiana legislature by the Louisiana Motor Transportation Association.

According to the plan, the gasoline tax will be eliminated from the auto license tax provisions and in this manner, it is claimed, make more funds available for highway purposes. The association has drafted a bill for presentation to the legislature as a substitute for the vehicle act now in force and has secured the endorsement of a large number of motor vehicle owners, particularly truck owners.

Short Talks on Refinery Products

By W. T. Ziegenhain

HOW TRANSFORMER OIL IS MADE

Transformer oil is classed as a special oil and is made in a comparatively few refineries. Probably more care is taken in the processing of this oil than any other petroleum oil shipped in large lots and used for commercial purposes. It must be absolutely free of moisture, non-corrosive, have a relatively low cold test, a low viscosity, evaporate at a very slow rate, have a high flashpoint and must not induce the formation of a sludge when kept in contact with metals at high temperatures over a long period of time. Such an oil may be made economically from only a relatively few crudes and particular care must be taken during the processing and shipping to guarantee its satisfactory performance in use.

The function of the oil is to keep the copper windings of electric transformer cool and as larger units are built, more exacting specifications have to be met. Because there is a decided advantage in transmitting electricity at high voltage over long distances, transformers are placed on the line both at the power source to "step up" the voltage and then others are used along the line to "step down" voltage wherever the line is tapped.

During the process of increasing or decreasing the voltage there is a loss of power comparable to a friction loss in a machine and this loss is dissipated in the form of heat. Even over a period of time the accumulation of heat might become sufficient to melt the insulation and the transformer would soon be "shorted" and cease to operate.

In construction, the transformer is simply two coils of copper wire around around an iron core the whole assembly being immersed in oil. The container for the oil is closed and gives room for an ample supply of oil. The cooling is done by the oil circulating through the coils where it becomes heated and then this heat is dissipated through the iron shell of the transformer into the atmosphere.

These transformers are not always operating and are often placed at remote points so in cold weather, there is a possibility of the oil becoming viscous, or, in extremely low temperatures, to solidify. For this reason a low cold test oil is required and the crude must be selected with this in mind. Assuming the crude does not contain excessive wax and is relatively free of corrosive compounds the balance of the specifications must be met by processing.

The first step in the processing is to segregate that portion of the oil that meets a definite distillation range. Because the viscosity and flashpoint are such important factors, only a relatively narrow cut can be taken. During the initial distillation of the crude when gasoline, kerosene and other oils are separated a cut is taken between kerosene and gas oil which includes the transformer oil. This cut is redistilled and a narrow cut of raw transformer oil taken.

This is chemically treated with sulphuric acid followed with caustic in special tanks to remove any sludge-forming constituents. From here it is taken to the filters and allowed to percolate through a filter clay where the water and any remaining impurities are removed. It is often necessary to refilter the oil in order to bring it up to specifications. In order to check its suitability and its freedom from water and suspended matter it is tested in a dielectric machine. The care needed in shipping this oil with respect to excluding all moisture and suspended matter as determined by the dielectric machine will be discussed in the next issue of The Oil and Gas Journal.

CALIFORNIA LEADS IN TOTAL GASOLINE DEMAND

Total gasoline tax collections by the respective states during 1927 has been reported as $258,838,813 by the United States Department of Agriculture through the Bureau of Public Roads. A total of 9,366,651,892 gallons of gasoline was taxed. California leads all other states in the amount of tax paid while Ohio ranked second. The amount paid by California was $22,467,083 and that paid by Ohio was $19,910,481.

California also leads in the volume of gasoline taxed and even though the consumption is not shown for New York or Massachusetts due to these states not having gasoline taxes, California is credited with having the highest consumption also. The tax collections and the volume of gasoline taxed by the respective states are shown below:

States and District of Columbia	Total Tax Earnings on Fuel for Motor Vehicles	Net Gallons of Gasoline taxed for use in Motor Vehicles
Alabama	$5,908,986	149,620,507
Arizona	1,388,830	40,216,927
Arkansas	4,338,737	94,345,820
California	22,467,083	928,748,702
Colorado	3,139,594	122,493,107
Connecticut	3,054,906	152,745,302
Delaware	662,159	23,486,804
Florida	10,980,586	251,410,081
Georgia	7,066,109	192,103,248
Idaho	1,571,749	40,874,738
Illinois	6,139,509	409,975,466
Indiana	10,133,568	337,769,317
Iowa	7,248,214	288,619,674
Kansas	4,594,650	229,732,510
Kentucky	5,913,396	118,267,918
Louisiana	3,034,056	151,702,807
Maine	2,288,933	72,007,253
Maryland	4,169,397	118,335,211
Massachusetts	.....	.....
Michigan	14,260,564	61,144,507
Minnesota	5,174,880	258,743,986
Mississippi	4,890,686	8,342,686
Missouri	6,330,983	316,549,141
Montana	1,436,398	47,879,927
Nebraska	3,664,919	183,245,970
Nevada	471,624	1,790,615
New Hampshire	1,268,907	44,897,901
New Jersey	4,082,860	204,142,900
New Mexico	1,415,690	30,117,191
New York	.....	.....
North Carolina	5,786,632	219,667,060
North Dakota	1,275,565	63,778,243
Ohio	19,910,481	752,028,064
Oklahoma	7,197,956	239,931,866
Oregon	3,643,191	122,822,563
Pennsylvania	17,296,333	691,562,015
Rhode Island	915,959	56,144,687
South Carolina	5,080,385	101,607,700
South Dakota	2,393,592	65,965,089
Tennessee	4,476,180	149,206,016
Texas	15,650,841	594,592,077
Utah	1,461,261	41,773,659
Vermont	905,244	33,167,246
Virginia	7,139,707	158,423,951
Washington	3,821,438	191,071,925
West Virginia	3,794,068	99,917,717
Wisconsin	6,027,114	301,355,684
Wyoming	756,049	25,884,393
Dist. of Columbia	1,148,794	57,439,721
Totals	$258,838,813	9,366,651,892

EXPANDS MARKET FACILITIES

The Louisiana Oil Refining Corp. spent $1,630,350 in 1927 in expanding its marketing facilities, according to a statement by Richard B. Kahle, president of the company. Additional bulk and service stations were acquired in Ohio, increasing company's gallonage in that division more than 50 per cent.

Gasoline sales totaled 68,503,000 gallons, increase of 35 per cent over 1926; motor oils 1,270,000 gallons, gain of 38 per cent, and grease 1,413,000 gallons, up 97 per cent. Total sales of all products were 236,507,000 gallons against 247,512,000 preceding year, gas oil showing considerable decline as cracking operations increased. Of total gasoline manufactured and sold, 793,749 bbls., or 53.36 per cent, were distributed through the company's own stations, compared with 493,357 bbls., or 40.66 per cent, in 1926.

At the end of 1927 the company owned and controlled 67 bulk stations, 328 filling stations and 3,024 loaned pumps.

DECIDE NEW TRADE-MARK INFRINGES FORD PRODUCT

By Charles E. Kern

WASHINGTON, D. C., May 5.—The decision of the examiner of trade-mark interferences holding that the word "Fordgas" as a trade-mark for fuel is not subject to registration as it is held to conflict with the trade-mark, "Ford Benzol," produced by the Ford Motor Co., has been affirmed by the Commissioner of Patents. The recommendation that the registrations be cancelled is affirmed. The Commissioner of Patents says:

"While the registrant has contended that petitioner has not carried on a very large business and that the benzol was a by-product from the petitioner's coke plant and, further, that the words 'Ford Benzol' were not used as a trade-mark, yet these contentions, even when admitted to be true, do not help the registrant in his defense. The tanks in which the benzol was delivered bore the notation 'Ford Benzol' and this is sufficient to establish such interest in this notation as to support the petitioner's claim of damage by the registration to the registrant of the latter's trade-mark whereby the registrant could interfere with the use by others of either the registrant's or the petitioner's notation.

"It must be held the registrant had not such exclusive use for a year prior to his application as to entitle him to registration."

RICHFIELD OIL COMPANY ENTERS FOREIGN MARKET

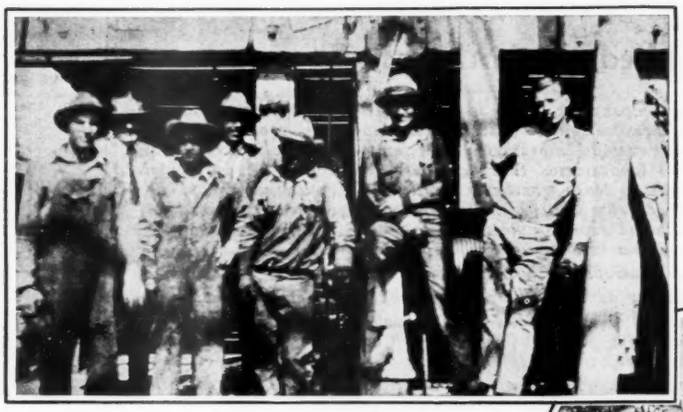
LOS ANGELES, Calif., May 5—The Richfield Oil Co. is making preparations to actively enter the Mediterranean market in competition with some of the Standard companies and the Dutch-Shell. A contract has been entered into with the Mediterranean Petroleum Distributing Corp. the latter company to distribute the products.

The distributing corporation was recently formed by foreign capital. It is understood that the sales will be centered in Greece and North Africa. Certain government concessions are expected to figure in the business of the company. The Richfield company through its own sales department has been active in developing South American outlets for its products.

The action of the company is in line with the action of other major independents in California. The Union Oil Co. recently through an alliance with the Atlantic Refining Co. made arrangements to actively develop its Asiatic trade. The California Petroleum Corp. now a subsidiary of the The Texas Corp. also has been active in foreign markets.

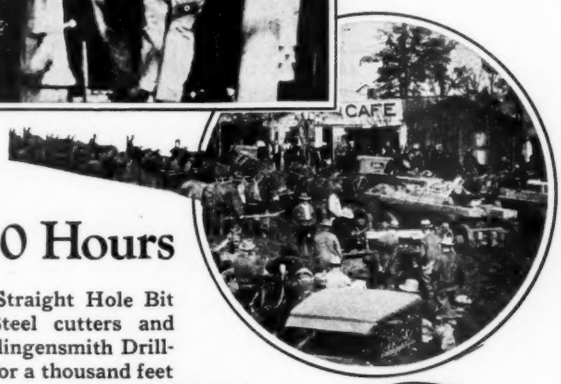
MEXICAN CONSUMPTION

Gasoline consumption in Mexico during the months of January and February of this year, according to figures of the Petroleum Section, Bureau of Special Taxes, Department of Finance, amounted to 31,350,770 liters. The amount of the highway tax of 10 per cent on first-hand sales was 940,523.10 pesos.



Crew of the Klingensmith Drilling Company who made this phenomenal drilling record.

Busy scene at Seminole, Okla., in the heart of the famous Seminole Area.



1,000 Feet of 11-in. Hole in 40 Hours

USING a Kennedye-Plumb Straight Hole Bit having Agathon Alloy Steel cutters and reamers, the above crew of the Klingensmith Drilling Company made 11-inch hole for a thousand feet through hard formations in 40 hours at Pearson Switch in the Greater Seminole Area. An offset well that started tour five days previous was passed by a hundred feet. And the cost for Agathon Alloy cutters and reamers averaged only 3 cents per foot.

The Kennedye-Plumb Corporation is backed by seventy years of experience in making fine tools. They know full well that to drill hard formations requires steel which can be heat-treated to resist abrasion and at the same time retain its toughness. The fact that after trying many other steels, these experienced tool makers standardized on Agathon Alloy Steels has its significance.

Tell us about your bit steel requirements. Let our expert metallurgists help you solve your steel problem without charge.

Central Alloy Steel Corporation, Massillon, Ohio

World's Largest and Most Highly Specialized Alloy Steel Producers

Makers of Toncan Copper Mo-lyb-den-um Iron

Cleveland · Syracuse · San Francisco · Detroit · Philadelphia · Chicago · Los Angeles · New York · Tulsa · St. Louis · Cincinnati · Seattle

AGATHON ALLOY STEELS

Methods of Measuring Detonation

Investigation Shows Certain Features of Tests Should Be Standardized At Once. Reference Fuel Results Often Misleading

By Neil Mac Coull*
The Texas Company

An investigation has been made of the possibility of correlating the measurements of the antiknock values of gasolines determined by various laboratories. With this end in view, six samples of gasoline were sent to each laboratory that expressed its willingness to co-operate in the investigation. These laboratories included those listed below, the number in each case indicating the identifying number used in the text and tables:

1. Anglo-Persian Oil Co., London.
2. Kansas City Testing Laboratory, Kansas City, Mo.
3. University of Michigan, Ann Arbor, Mich.
4. Atlantic Refining Co., Philadelphia.
5. Standard Oil Co. of Indiana, Whiting, Ind.
6. The Texas Company, Bayonne, N. J.
7. Bureau of Standards, City of Washington.
8. Chrysler Corp., Detroit, Mich.
9. Tide Water Oil Co., Bayonne, N. J.
10. Mellon Institute, Pittsburgh, Pa.

The six gasolines used had a wide range of antiknock values and volatility. We desired particularly to learn whether volatility affected the antiknock values determined on multicylinder engines more than those determined on single-cylinder engines. In Table 1 are shown the results of the tests, together with a measure of the volatility of the gasolines as expressed by their mean boiling points.

The Apparatus and Methods of Testing Used

An analysis of the main features of the apparatus and the methods of testing used by the co-operating laboratories is shown in Table 2. In spite of the apparently heterogeneous nature of the data, one point that they have in common may prove to be the fundamental point necessary to produce interchangeable antiknock values, namely, the method of controlling detonation by varying the compression pressure. Mechanically, this is accomplished in two ways, (a) altering the volume of the combustion space that controls the compression ratio, as in so-called variable-compression engines, or (b) altering the initial pressure with the throttle, as in engines having a fixed compression ratio.

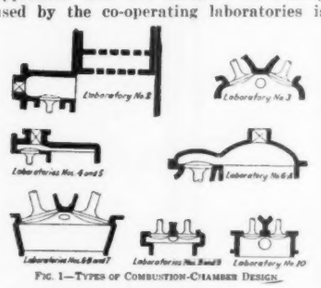


FIG. 1—TYPES OF COMBUSTION-CHAMBER DESIGN

These combustion chambers used in tests by the co-operating laboratories, have been drawn approximately to scale to indicate their variation in size.

The design and the size of the combustion chamber greatly affect detonation, as Ricardo has again shown in a recent address, in which he stated that he had changed the compression ratio at which knocking in an engine begins, from 5.2 to 6.0, simply by moving the position of the spark plug.

Whether such a feature of design will offer difficulty in correlating antiknock data is still to be proved, very few data in this investigation being of value on this angle of the subject because of the variation of the technique of operating the engines. For reference, the designs of several of the combustion chambers of engines used in the tests by the co-operating laboratories are shown in Figure 1. They are approximately to scale in order to indicate their variation in size.

The methods used in operating the engines may be clarified by dividing the test procedure into the following steps:

1. An engine that can be made to detonate must be used.
2. The engine must be under control from the nondetonating to the detonating range. This is accomplished by varying the final compression pressure by (a) altering the volume of the compression space while holding the throttle fixed, or (b) altering the initial compression pressure by the throttle.
3. Detection of the detonation point by (a) audibility, which may be of light or of heavy intensity, (b) the bouncing pin, or (c) the maximum efficiency as determined by the maximum power output and the measurement of waste heat, by taking the temperature of the exhaust valve, the jacket loss, and the like.
4. Evaluation of results in terms of (a) the increase of the compression ratio allowable, the power output, or the manifold vacuum, (b) an equivalent antiknock fuel made by mixing some reference fuel of low antiknock value, such as Pennsylvanian gasoline, with tetraethyl lead, isoamyl nitrite (a knock inducer), or benzol, (c) the addition of tetraethyl lead to the fuel being tested, to equal a reference fuel of high antiknock value.

This outline does not, of course, exhaust the possibilities, but covers the majority of the methods now in use.

Before leaving the description of test methods, attention is called to the novel method used by Laboratory 1 for the detection of the detonation point, since this method is not well known in this country.

With a standard reference fuel, the compression ratio is raised until the first detonation is audible. A reading is then taken of the number of knocks or "pinks" per minute. The ratio is then raised 0.1 and another estimate is made of the number of knocks per minute. One more rise of 0.1 of a compression is made, and the data are plotted as in Figure 2, the scale of knocks per minute being logarithmic to straighten the line.

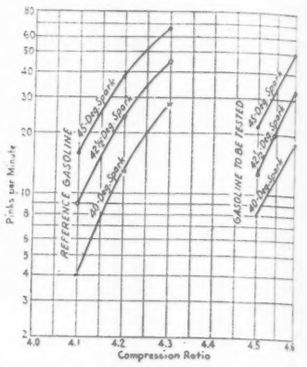


FIGURE 2—NOVEL METHOD USED BY LABORATORY

The data are reported in terms of increase of compression ratio, between an unknown fuel and a reference fuel. This difference is taken as the average distance between time plotted for both fuels showing the intensity of detonation by the number of "pinks" per minute at various compression ratios. Results are averaged for several spark positions.

This is done for three different spark advances, namely, 40, 42.5 and 45 degrees. The engine is thus calibrated and is ready for the fuel to be tested. This fuel is treated in the same way and gives the curves shown at the right of Figure 2. The horizontal distances between corresponding lines for the reference fuel

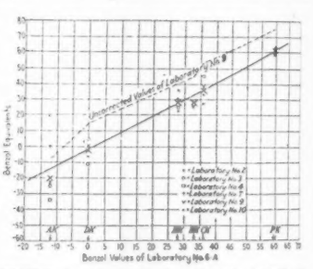


FIGURE 3—CURVES SHOWING COMPARATIVE BENZOL VALUES OBTAINED BY THE VARIOUS LABORATORIES, PLOTTED AGAINST THE VALUES OBTAINED FROM THE FOUR-CYLINDER ENGINE OF LABORATORY 6-A

The average for each reference fuel is shown by a large X. These averages fall in a straight line except for fuels AK and DK. These, being of lower volatility than the others, indicate the effect of volatility on antiknock rating in multicylinder engines.

Needs in Antiknock Testing

The accompanying article is the report of an attempt made to correlate measurements of antiknock values of gasolines as determined by various laboratories. Six samples of gasoline were sent to each 10 laboratories that agreed to co-operate, the principal object being to learn whether volatility affects the antiknock values obtained from multicylinder engines more than it affects the values obtained from single-cylinder engines... The results of the tests are shown in numerous tables and charts.

The conclusions reached are that

1. *Further development of antiknock measurements is needed.*
2. *Certain elements of technique, such as the mixture ratio and the spark setting should be standardized at once.*
3. *Intensive study should be made of the fundamental methods in use for the direct control of detonation in test engines, such as the compression ratio and the manifold vacuum.*
4. *Measurement of antiknock values in terms of the mixtures of a reference fuel with benzol or tetraethyl lead is likely to be very misleading if the peculiarities of such scales are not thoroughly understood by the investigator.*
5. *The data obtained indicate that probably no great difference in the results exists whether the detonation point is determined by durability, the maximum power, or the bouncing pin.*
6. *The size and type of engine used does not seem to affect the results.*
7. *Eventually, a reference fuel of low antiknock value and one of high antiknock value should be standardized.*

TABLE 1—ANALYSES OF SIX TEST FUELS USED IN THIS INVESTIGATION

	Test Fuel					
	AK Petroleum Spirits	BK 3.4 cc. of Ethyl Fluid per gal. of AK	CK 50 per cent of 90 per cent Benzol and 50 per cent of AK	DK Gasoline	EK Gasoline	FK Gasoline
Color, Saybolt	+25	Red	+20	+25	+21	+18
Gravity, A.P.I.	49.5	49.0	40.1	58.4	60.2	52.9
Doctor test	Negative	Negative	Negative	Positive	Negative	Negative
Copper dish corrosion	Good	Good	Good	Good	Good	Good
Copper strip corrosion	Good	Good	Good	Good	Good	Good
Bureau of Mines gumming	None	None	None	None	None	None
Distillation	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.	Deg. Fahr.
Initial boiling point	290	293	176	120	92	100
10 per cent	320	317	187	202	146	144
20	326	326	195	228	180	182
30	332	330	213	246	211	214
40	339	338	218	260	239	240
50	345	345	248	274	265	262
60	352	352	306	292	285	282
70	361	362	338	309	306	306
80	372	375	356	330	328	330
90	393	392	378	365	356	356
95	410	409	398	399	380	380
Endpoint	436	436	420	436	392	390
Recovery, per cent	98.5	98.5	98.0	98.5	97.5	97.5
Residue, per cent	1.0	1.0	1.0	1.0	1.0	1.0
Loss, per cent	0.5	0.5	1.0	0.5	1.5	1.5
Mean boiling point, degrees Fahrenheit	357	356	286	289	265	266

*Presented at meeting of Society of Automotive Engineers. Reprinted from official publication of society.

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TABLE 2—CHARACTERISTICS OF APPARATUS AND METHODS OF TESTING

Laboratory Number Laboratory Name	1 Anglo-Persian Oil Co.	2 Kansas City Testing Laboratory	3 University of Michigan	4 Atlantic Refining Co.	5 Standard Oil Co of Indiana	6 The Texas Co.		7 Bureau of Standards	8 Chrysler Corporation	9 Tide Water Oil Co.	10 Mellon Institute
						A	*B*				
Shape of Combustion Chamber	I	L	I	L	L	L	I	I	I	I	I
Number of Cylinders	1	1	1	1	1	4	1	1	1	1	1
Bore and Stroke, in.	3½x6	5x8	5x7	2¼x4	2¼x4	4½x6¼	5x6	5x7	2½x5	2½x5	2½x5
Speed, r.p.m.	1200	500	1000	1200	1300	400	400	1500	1000	1000	1000
Valves per Cylinder	4	2	4	2	2	2	2	2	2	2	2
Compression-Ratio	3.9 to 8	3 to 9	3 to 17	6.5	5.6	4.7	6.3	6.3	7.6	7.4	5.8
Carbureter - Air Temperature, deg. fahr., Mixture-Ratio	100 Fuel Rate Adjusted to 7.7 Pt. per Hr.	70-80 Non-Adjustable	150 13.1	140 Set at 13 to 1 for Reference Fuel	120-125 11 to 1	210 Non-Adjustable	Room 13 to 1	Room Varied for Maximum Power	Room Non-Adjustable	Room Vary for Maximum Detonation of Unknown Fuel	131
Spark Advance, deg.	40, 40½, 45	30	15, 25	25	21	30	20	30	.....	Maximum Power	25
Controlled by	Compression	Compression	Compression	Throttle	Throttle	Throttle	Throttle	Throttle	Throttle	Throttle	Throttle
Method Used	Audibility	Audibility	(a) Audibility (b) Maximum Power	Audibility	Audibility	Audibility	Audibility	Audibility	Bouncing-Pin	Bouncing-Pin	Special Bouncing Pin
Results in terms of	Difference of Compression-Ratio	Compression-Ratio and Benzol	Compression-Ratio and Benzol	(Manifold Vacuum) Benzol, Tetraethyl Lead	Ethyl Fluid	(Manifold Vacuum) Ethyl Fluid	Manifold Vacuum	Indicated Horse-Power Increase, Per Cent	Ethyl Fluid	Special Numbered Benzol Blends	Benzol or Iso-Amyl-Nitrite
Reference Fuel	A Definite Refinery Cut Gasoline	Straight-Run Gasoline Having Minimum Anti-Detonating Value	Straight-Run Pennsylvania Federal Specification Fuel	Straight-Run Mid-Continent Gasoline of United States Specification	Straight-Run Mid-Continent Gasoline, Slightly Better than United States Motor Specification	Petroleum Spirits	Straight-Run Pennsylvania Gas of 400 End-Point	(a) United States Motor No. 12 (b) Cabin Creek Gasoline	Ethyl Gasoline Laboratory. Standard Anti-Knock Fuel	Standard Straight-Run Pennsylvania Gasoline	Straight-Run Gasoline from Mixed Average Oklahoma, North Texas Crude

and the fuel under test are taken at several points and averaged. This average difference is a measure of the increase of the compression ratio allowable for the fuel.

Antiknock Values Reported

The results reported by the co-operating laboratories have been collected in Table 3. At the right of Table 3, an attempt has been made to correlate these data by taking the value of Sample AK as zero and the value of Sample CK as 100 per cent, and locating all other values in terms of their percentage between these two points. This implies that a mixture of one part of Sample AK having a value of 0 per cent with one part of Sample CK having a value of 100 per cent would have a value of 50 per cent, if the basis used by the laboratory were a direct measure of the antiknock value. Sample FK had originally been planned as the 100 per cent point but since several laboratories found difficulty in evaluating this sample, the next best sample was taken. Furthermore, Sample CK is the same as Sample AK, except for the addition of 50 per cent of benzol; and most laboratories gave a benzol equivalent to their readings.

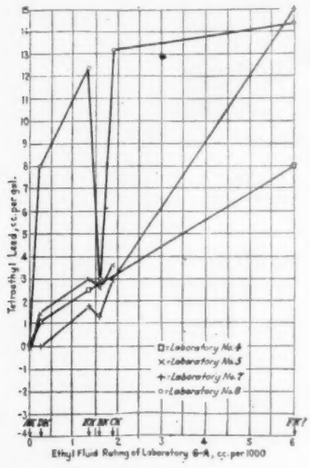

FIGURE 4—CURVES OF THE COMPARATIVE VALUES OF TETRAETHYL LEADS OBTAINED BY THE VARIOUS LABORATORIES, PLOTTED AGAINST VALUES FOR LABORATORY 6-A

At the bottom of Table 3, the averages of the values reported by all laboratories are shown. The great variation given by these laboratories warrants a detailed analysis. One means of doing this was to group together all readings taken for each type of antiknock scale.

Benzol Equivalents

In Table 4 the benzol values are retabulated from Table 3. The column showing the differences between the highest and the lowest values reported for each sample indicates that the greatest variation is in Sample AK and the least in Sample BK.

We had expected that all the values reported by some laboratories would be higher than those by some other laboratories, because of the different antiknock values of the stocks of gasoline used as reference fuels. The location of the points for each laboratory, given in Figure 3, shows that none is consistently higher or lower than the others, except Laboratory 9. In making up the averages, the liberty was taken of subtracting 15 from all the readings shown by this laboratory. The justification for this procedure is shown in Figure 3. The dotted line shows the uncorrected values. The variation between these readings and those from all the other laboratories seems to be caused more by errors of observation than by differences in the

TABLE 3—RESULTS REPORTED BY CO-OPERATING LABORATORIES

	Reported Values						Comparative Values (AK=0 and CK=100 per cent)			
	AK	BK	CK	DK	EK	FK	BK	DK	EK	FK
1—Anglo-Persian Oil Co.										
Increase of Compression Ratio:										
Observer A	—0.29	0.24	0.61	—0.15	0.22	1.34	59	15.5	57	181
Observer B	—0.29	0.25	0.57	—0.17	0.24	1.28	63	14.0	62	183
2—Kansas City Testing Laboratory										
Benzol equivalent	—24	24	27	—6	36	†45	94	20	137	...
Compression ratio	3.16	3.72	3.74	3.37	3.85	†3.95	97	36	144	...
Increase in Compression ratio, per cent	—9.1	8.1	8.7	—2.1	11.9	†14.8	96	36	119	...
Power, watts	440	456	473	425	437	†465	..	..	..	...
Power increase, per cent	2.1	6.8	10.8	—0.6	2.3	†8.9	48	—47	—10	...
3—University of Michigan										
Compression Ratio:										
Audible Knock:										
25-deg. spark advance	4.35	4.9	5.22	4.65	4.88	5.95	63	34	62	181
15-deg. spark advance	4.91	5.44	5.50	5.10	5.40	6.45	90	32	83	260
Maximum Power:										
25-deg. spark advance	4.5	5.1	5.47	4.92	5.15	6.15	62	43	67	170
15-deg. spark advance	5.15	5.73	6.12	5.40	5.85	6.76	60	26	72	166
Benzol Value with Pennsylvania Gasoline:										
Audible Knock:										
25-deg. spark advance	—20	25	44	10	25	60	70	47	70	125
15-deg. spark advance	—20	30	32	0	22	65	96	38	81	163
Maximum Power:										
25-deg. spark advance	—25	25	45	10	28	62	71	50	76	124
15-deg. spark advance	—30	28	45	0	33	63	77	40	84	124
Average	—25	27	45	5	28	62.5	74	43	76	125
4—Atlantic Refining Co.										
Manifold Vacuum, in. of mercury	4.37	3.7	3.6	4.1	3.75	3.15	..	..	..	...
	0	37	40	21	36	56	92	52	90	140
Benzol, per cent	—34	29	36	—11	25	59	90	33	84	133
	0	2.7	3.1	1.1	2.5	8.0	87	35	80	258
Tetraethyl lead per gallon, cc	—2.3	1.7	2.5	—0.5	1.4	9.5	83	37	77	246
5—Standard Oil Co. of Indiana										
	3.6	1.0	0	2.1	0.6	....	72	42	83	...
Tetraethyl lead per gallon, cc.	—2.1	0.5	1.5	—0.6	0.9	4.6?	72	42	83	186
6—The Texas Company										
(A) Four-cylinder engine:										
Manifold vacuum, cm. of mercury	36.3	30.4	30.5	35.5	31.5	....	..	..	..	..
Power, b. hp.	5.7	7.4	7.3	5.9	7.0	....	..	..	..	...
Equivalent ethyl fluid per liter, cc.	0	1.8	1.9	0.25	1.35	....	84	13	71	...
Benzol, per cent in Pennsylvania gasoline	—12	33	36	0	28	....	94	25	83	...
(B) Single-cylinder engine:										
Manifold vacuum, cm.	35.9	31.3	31.2	34.7	33.1	27.3	98	27	81	195
Benzol equivalent, per cent	34.2	28.9	29.6	33.1	30.5	25.6	92	22	77	216
7—Bureau of Standards										
U. S. Motor fuel No. 12:										
Power increase, per cent of i. hp.	—23.5	—13	—5.5	—23.5	—10	25	58	0	75	270
Benzol equivalent, per cent*	....	....	....	....	....	40	..	..	..	...
Ethyl fluid per gallon, cc.*	....	....	....	....	....	7	..	..	..	...
Cabin Creek Reference Fuel:										
Power increase, per cent of i. hp.	0	13.5	23.5	0	17.5	63	57	0	74	269
Benzol equivalent, per cent*	0	25	35–40	0	30	50+	67	0	80	133
Ethyl fluid per gallon, cc.*	0	2–3	6	0	3–4	30	33–50	0	50–67	500
8—Chrysler Corporation										
Ethyl fluid, cc. per gal. relat., to FK	14.4	11.4	1.2	6.4	2.0	0	23	66	94	109
Ethyl fluid, cc. per gal. Std. rating	14.0	11.0	0.8	6.0	1.6	—0.4	..	..	..	...
9—Tide Water Oil Co.										
Scale No.	16.5	6.0	4.5	12.0	7.0	0	87	37	79	137
Benzol equivalent, per cent	—7.5	45	52.5	15	40	75	..	..	..	...
10—Mellon Institute										
Benzol equivalent, per cent	....	25	33		23	50+	..	..	..	...
Isoamyl nitrite, per cent	0.35	....	....	0.07	....	....	..	..	..	...
Rating, per cent:										
Benzol basis	0	52.4	59	19.7	50.8	100	89	33	86	170
Isoamyl nitrite basis	0	42.2	51.6	7.8	39.1	100	82	15	76	194
Range										
Maximum	....	....	....	....	....	....	97	66	144	500
Minimum	....	....	....	....	....	....	23	—47	—10	109
Average	....	....	....	....	....	....	74	30	80	190

†Values for mixture with an equal volume of reference fuel.
*Estimated.

TABLE 7—COMPARISON OF DATA FROM VARIABLE-COMPRESSION AND FROM FIXED-COMPRESSION ENGINES

Method	Compression-Ratio						Manifold Vacuum	
	Maximum Power		Audible Detonation				Audible Detonation	
	3		1	2	3		4	6
Laboratory	15° Spark Advance	25° Spark Advance			15° Spark Advance	25° Spark Advance	A	B
(a) Actual Values AK	5.15	4.50	3.81	3.16	4.91	4.35	4.37	36.30	34.20
BK	5.73	5.10	4.34	3.72	5.44	4.90	3.70	30.40	29.90
CK	6.12	5.47	4.69	3.74	5.50	5.22	3.60	30.50	29.60
DK	5.40	4.92	3.94	3.37	5.10	4.65	4.10	35.50	33.10
EK	5.85	5.15	4.31	3.85	5.40	4.88	3.75	31.50	30.50
FK	6.76	6.15	5.41	*3.95	6.45	5.95	3.15	....	25.60
(b) Per Cent of Increase AK	0	0	0	0	0	0	0	0	0
BK	11.50	13.50	14.00	17.50	11.00	12.50	18.00	19.00	14.50
CK	19.00	21.50	23.00	18.50	12.00	20.00	21.00	19.00	15.50
DK	5.00	9.00	3.30	6.50	4.00	7.00	6.50	2.00	4.00
EK	13.50	14.50	13.00	22.00	10.00	12.00	16.50	15.00	12.00
FK	31.00	36.50	42.00	*25.00	31.00	37.00	29.00	....	34.00

*Values for mixture with an equal volume of reference fuel.

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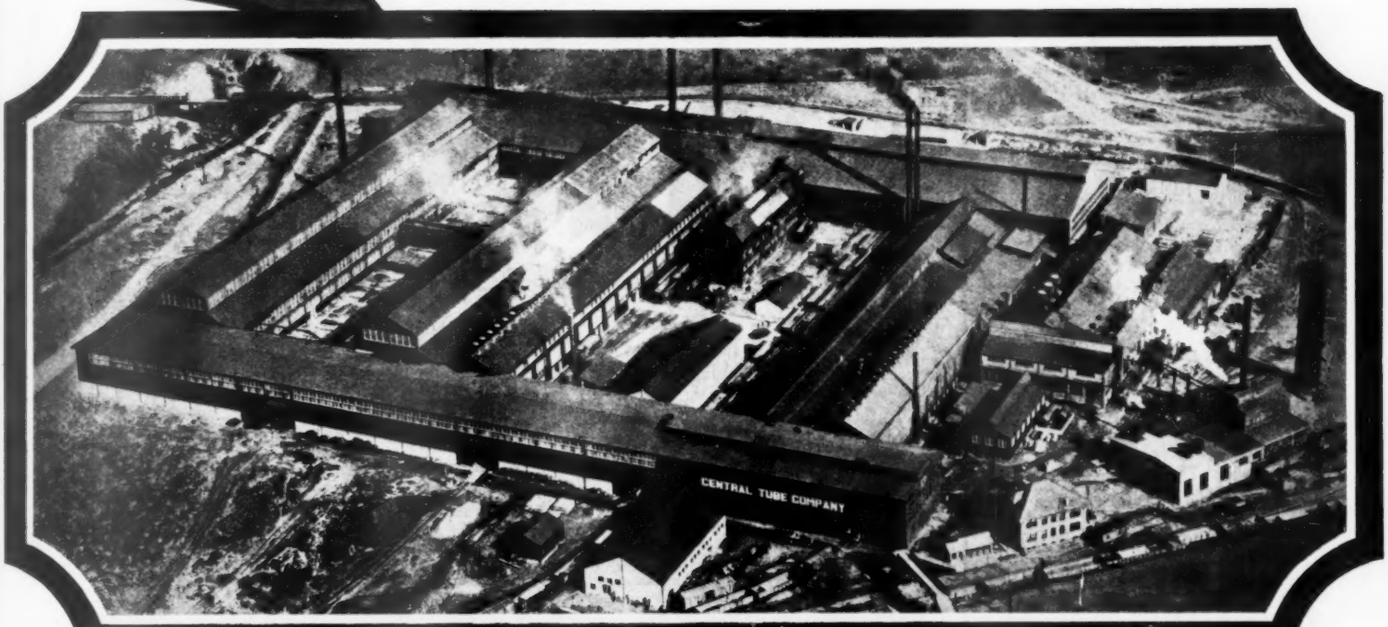

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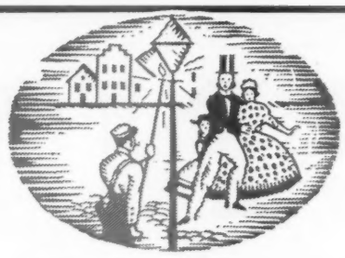

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reference fuels used. An average of all the benzol equivalents was considered to give a good indication of the true value for each sample.

Sample CK was made up of AK and 50 per cent of benzol. If the average value of AK, 20 per cent, be subtracted from that of CK, 36 per cent, this would account for 56 per cent of benzol, which is not far off. Sample DK, a Pennsylvania gasoline, had nearly the same antiknock value as the reference samples used by other laboratories.

Effect of Volatility

The values from Table 4 were plotted in Figure 3 against the benzol values obtained with the four-cylinder engine of Laboratory 6-A. The averages from all the laboratories are indicated by large crosses that fall with remarkable consistency on the straight line shown, excepting Samples AK and BK. To make the points for these two samples fall on the same line, they would have to be moved to the left a distance equivalent to about 5 per cent of benzol, giving AK a value of —17 per cent and BK a value of 28 per cent. In other words, the values of these two samples given by Laboratory 6-A, which control the horizontal positions of all points, seem to be to high. This is believed to be evidence of the effect of volatility,

TABLE 4—Benzol Equivalents of Various Samples of Gasoline in Per Cent

	Laboratory Symbol							Difference	Average	Relative per cent
	2	3	4	6	7	7	10			
AK	—24	—25	—34	—12	0	(—7.5)—23†	..	34	—20	0
BK	24	27	29	32	25	(45) 30†	25	9	28	86
CK	27	45	36	36	35–40	(53) 38†	33	18	36	100
DK	— 6	5	11	0	0	(15) 0†	..	16	2	32
EK	36	28	25	28	30	(40) 25†	23	13	28	86
FK	45*	62.5	59	..	50+	(75) 60†	50+	35	61	145

*Values for mixtures having an equal volume of reference fuel.
†Corrected values.

for these two samples are the only ones that have appreciably lower volatility than the others. In single-cylinder engines, the volatility would be expected to have but little effect, but the multiple-cylinder engines the story is different because of the likelihood of uneven fuel distribution.

Laboratory 6, the only one that uses a multiple-cylinder engine, is therefore most

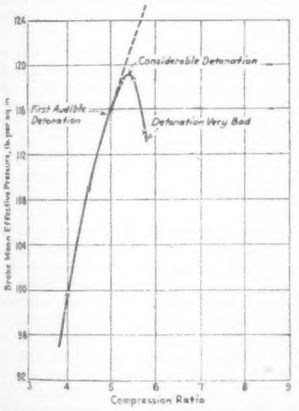

FIGURE 5—CURVE SHOWING SHARP DEFINITION OF THE DETONATION POINT AS DETERMINED BY THE COMPRESSION RATIO GIVING MAXIMUM POWER

likely to show the effect of volatility. It is evident that uneven distribution of fuel to the cylinders will reduce the apparent tendency of a fuel to knock, because of the well-known fact that the correct mixture will knock more than one that is either leaner or richer. Thus, a fuel of low volatility might be given a higher antiknock value in a multiple-cylinder engine than it should really have, as apparently happened in Samples AK and BK. This characteristic of a multiple-cylinder engine should not be dismissed without noting that almost all fuels of today are used in multiple-cylinder automobile engines, in which volatility has an effect on the antiknock value similar to that in the engine now used in Laboratory 6-A.

Tetraethyl Lead Equivalents

In Table 5 are shown the values taken from Table 3, which were reported by

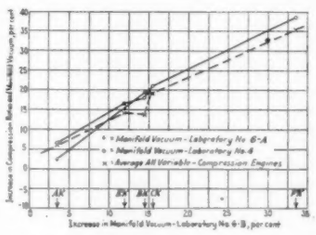
Increase in Compression Ratio at Maximum Power, per cent
Increase in Manifold Vacuum—Laboratory No. 6-B, per cent
o = Manifold Vacuum—Laboratory No. 6-A
o = Manifold Vacuum—Laboratory No. 4
x = Average All Variable-Compression Engines
AK
EK
BK CK
FK

FIGURE 6—COMPARISON OF RESULTS OBTAINED FROM VARIABLE-COMPRESSION ENGINES

Expressed as per cent increase of compression with fixed compression engines when expressed as per cent increase of manifold vacuum.

laboratories that gave their data in terms of tetraethyl lead.

The values shown for the Laboratories 5 and 8 are not the same as those given in Table 3. Laboratory 5 originally reported the amount of tetraethyl lead that must be added to all the samples to equal CK, and Laboratory 8 reported the amount to equal FK. To make the data of Table 4 comparative, the liberty was taken of attempting a conversion by subtracting all values of Laboratory 5 (first column(from 3.6 and by subtracting those of Laboratory 7 from 14.4. The converted figures of Laboratory 8 look so erratic that they have been omitted when computing the difference and average columns. The data of Laboratory

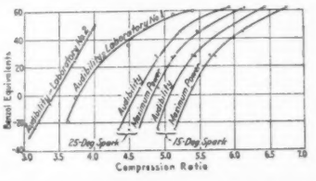

FIGURE 7—RELATION OF COMPRESSION RATIO TO BENZOL EQUIVALENT REPORTED BY LABORATORIES 1, 2, AND 3

The four curves on the right are for laboratory 3, whose report includes several methods of detecting detonation.

6-A have been multiplied by 1.97 to convert the reading of ethyl fluid from cubic centimeters per liter into cubic centimeters per gallon.

An unexpected point was brought out by Laboratories 4 and 5, since each reported two sets of values. In one set, the values of all samples were compared with Sample AK, and in the other set with their own reference fuel. These two sets of figures for Laboratory 5 show a constant difference of 1.5 for all samples, indicating that one was calculated from the other. Laboratory 4, stating that this is an unjustifiable procedure, gives values that show a progressive difference from minus 2.3 for AK, to plus 1.5 for FK.

Percentage of Power Increase

Table 6 shows the percentage of increased power developed by various samples of gasoline over that which could be secured from Sample AK. The

TABLE 5—Tetraethyl Lead Equivalents in Cubic Centimeters Per Gallon

	Laboratory Symbol						Difference	Average	Relative percentage
	4		5		6	7	8			
AK	0	(—2.3)	0	(—2.1)	0	0	(0)	0	0	0
BK	2.7	(1.7)	2.6	(0.5)	3.3	1.3	(3.0)	2.0	2.46	74
CK	3.1	(2.5)	3.6	(1.5)	3.7	3.0	(13.2)	0.7	3.35	100
DK	1.1	(—0.5)	1.5	(—0.6)	0.5	0	(8.0)	1.5	0.8	24
EK	2.5	(1.4)	3.0	(0.9)	2.7	1.8	(12.4)	1.2	2.49	75
FK	8.0	(8.5)	..	(4.67)	11.8	15.0	(14.4)	7.0	11.60	347

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variations are even greater than those obtained by other methods.

TABLE 6—Percentage of Power Increase Based on Audible Detonation

	Laboratory Symbol		
	2	6-A	7
AK	0	0	0
BK	3.7	30.0	13.5
CK	7.7	28.0	23.5
DK	3.5	4.0	0
EK	0.7	23.0	17.6
FK	7	...	63.4

If the friction and other power losses of these engines were known, so that the indicated, instead of the brake or the electrical, horsepower could be used in all instances, this method might be more consistent than it seems to be in this table. The data from Laboratories 2 and 6-A are given in terms of power output, only Laboratory 7 reporting in terms of indicated horsepower.

Compression Ratio

Some of the most interesting and important material developed in this investigation has been secured from the three laboratories using variable-compression engines. The fundamental value of data secured from variable compression engines is due to the fact that the prime interest in the antiknock value of fuels is assumed to lie in the compression ratios that can be used in engines to which they are supplied. Another very inviting feature of these engines is that they make possible antiknock determinations on the basis of the compression ratio giving the maximum power. Such determinations do not involve the personal element of the operator's ear, as all audibility methods do. Figure 5, supplied by Laboratory 3, shows how sharply defined the point is for the compression ratio giving the maximum power.

Attention has been called to the expectation that data from variable-compression engines might be directly comparable with manifold vacuum figures from fixed-compression engines. For this reason, part (a) of Table 7 shows all the variable-compression and manifold-vacuum figures that were reported. The actual compression ratios for Laboratory 1 were computed from Table 3 by adding 4.1. This value was taken from Figure 2 and was considered as the point at which an operator might record the first "audible detonation." How the intensity of detonation recognized by the operator might affect the actual compression ratio that he would report is apparent.

The compression ratios for maximum power average about 0.3 of a ratio above the compression ratios selected by audibility. The intensity selected by an operator must affect this difference, but apparently a simple relation exists between these two methods even though they are so different in principle.

In part (b) of Table 7 are shown the percentages of increase of all samples, compared to AK, for the compression ratio and manifold-vacuum data. In each case the larger value was divided by the smaller, and 100 was then subtracted to show the percentage of increase.

Table 8 compares the average values obtained from each of the three methods used in Table 7. The agreement is more satisfactory than was hoped for.

The exceptionally satisfactory agreement among these three methods is noteworthy. Not only is there no appreciable difference between the variable and the fixed-compression engines but the results obtained by the audibility method were similar to those taken at maximum power. To show clearly the similarity of the data from various laboratories, the percentage figures from the single-cylinder engine of Laboratory 6-B are plotted horizontally in Figure 6, the corresponding readings from Laboratory 4 and the multicylinder engine B of Laboratory 6 being plotted as ordinates. The agreement is very good. Another set of readings is also given in which the averages from each of the two variable-compression engines have been plotted as ordinates. This still further accentuates the agreement. This figure does not substantiate the evidence of the effect of low volatility that was shown in Figure 3, though Sample BK still shows a tendency to irregularity.

Since Laboratories 2 and 3 both gave benzol equivalents for their compression ratios, these relations have been plotted in Figure 7. For Laboratory 1, benzol values were assumed as the average values shown in Table 4. The similarity of the curves obtained by Laboratory 3 for the values taken for audible detonation and for maximum power recalls the close relation between these two methods that has been mentioned.

From Figure 7 and Figure 12, which will be referred to later, the relation between the compression ratio and the manifold vacuum was plotted, in Figure 8, for various benzol blends in Sample DK, thus comparing data from variable-compression engines with those from a fixed-compression engine. The remarkable straightness of the lines is still more evidence of the close relation between these methods and gives encouragement to this attempt to correlate data obtained from variable-compression engines with those from fixed-compression engines, by either the audibility or the maximum-power method. There is no fundamental difference in the action of the gases. In the variable-compression engine, a fixed volume of combustible mixture is drawn into the cylinder and the compression ratio is varied by changing the volume of the compression space. In the fixed-compression engine, the volume of the compression space being constant, the ratio is altered by changing the volume of the mixture entering the cylinder at atmospheric pressure. Measurement of this volume may be made by any convenient means. Laboratory 6-B uses a gas holder, but finds it simpler to record the manifold vacuum, since a direct relation exists between the vacuum and the volume of the air supply per revolution, as well as the compression pressure.

One more point of interest in the data of group (a) of Table 7 is the considerable variation in the compression ratio allowance for any one fuel sample in the different engines used. This shows clearly the impossibility of stating that a given fuel could be used in an engine having a particular compression ratio without at the same time specifying the engine.

Some Additional Antiknock Studies

Some data bearing on the subject of antiknock measurements have been secured from a single-cylinder engine that has been in operation in our laboratory for several months. The principal features of the setup are shown in Figure 9. The engine consists of a standard steel Liberty airplane-engine cylinder mounted on a marine-engine crankcase, which fixed the piston stroke at 6 inches. The engine speed was limited to 400 r.p.m., instead of the customary higher speeds, for three reasons, namely, (a) much less mechanical noise, (b) lower consumption of fuel on a test and (c) less likelihood of the valves and spark-plugs becoming overheated and complicating the phenomena of detonation.

Other important features of this setup were:

1. The air to the carbureter was metered by a gasholder made from a 55 and a 100-gallon steel drum. The pulsating nature of the air flow necessitated suspending the movable drum by a coiled spring. Electrical contacts closed by the movement of the drum operated a stop watch and a revolution counter.

2. A horizontal Stromberg carbureter

TABLE 8—AVERAGES OF EACH METHOD OF TABLE 7

	Compression-Ratio for Maximum Power	Compression-Ratio for Audible Detonation	Manifold Vacuum for Audible Detonation	Grand Average	Percentage Rating
AK	6	6	6	6	77
BK	13	14	17	14.7	100
CK	20	18	19	19.0	28
DK	7	5	4	5.3	75
EK	14	14	15	14.3	100
FK	34	37	37	36.0	

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3. The engine was connected to a 10-kilowat shunt-wound motor, which "floats" on the line and maintains a fairly constant speed at any throttle position. Even during the period in which the fuel is drained from the carbureter, the drop in speed is only small. This eliminates much of the time normally used in starting and regulating a dynamometer, unless a double carbureter is provided.

4. A steam cooling system was used.

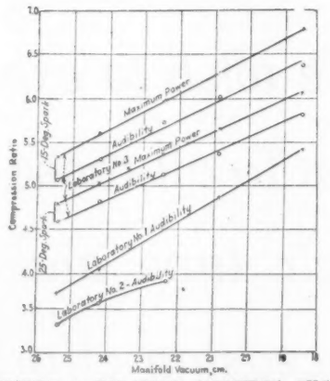

FIGURE 8—RELATION BETWEEN THE COMPRESSION RATIO AND THE MANIFOLD VACUUM FOR VARIOUS BENZOL BLENDS

This shows a straight line relation between these two methods.

which shortens the warming-up period and maintains a constant cylinder-head temperature without manual or thermostatic control.

5. The detonation, point, determined by ear, was recorded by manifold vacuum A 5-gallon surge tank was placed between the intake pipe and the manometer to damp out the pulsations. The fluid used in the manometer had a specific gravity of 2.04.

Effect of the Mixture Ratio

The first work done on this engine was a determination of the effect of mixture ratio on detonation. Figure 10 shows the results for several completely different types of fuel and indicates that any type of fuel with which we are likely to deal will give the maximum detonation at approximately a 13 to 1 air-fuel ratio. We therefore standardized on this ratio for all future work. This was a step of great importance, for the mixture ratio of any carbureter changes appreciably with different throttle openings. The dotted line A_1-A_2 in Figure 10 gives the natural variation of the mixture ratio with the throttle position for an arbitrary carbureter setting. This is a fundamental carbureter characteristic that is responsible for one of the principal practical advantages of the variable compression engine, since these engines operate without adjustment of the throttle. If a large

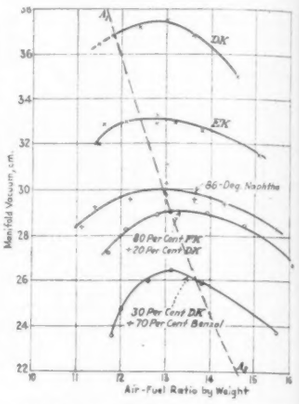

FIGURE 10—EFFECT OF MIXTURE RATIO ON DETONATION

These curves show that any type of fuel with which we are likely to deal will give the maximum detonation at approximately a 13 to 1 air-fuel ratio by weight.

number of commercial samples having similar viscosity are tested in a variable compression engine, the mixture ratio set for one fuel will be substantially constant for all the others at all compression ratios. Even when fuels of different vis-

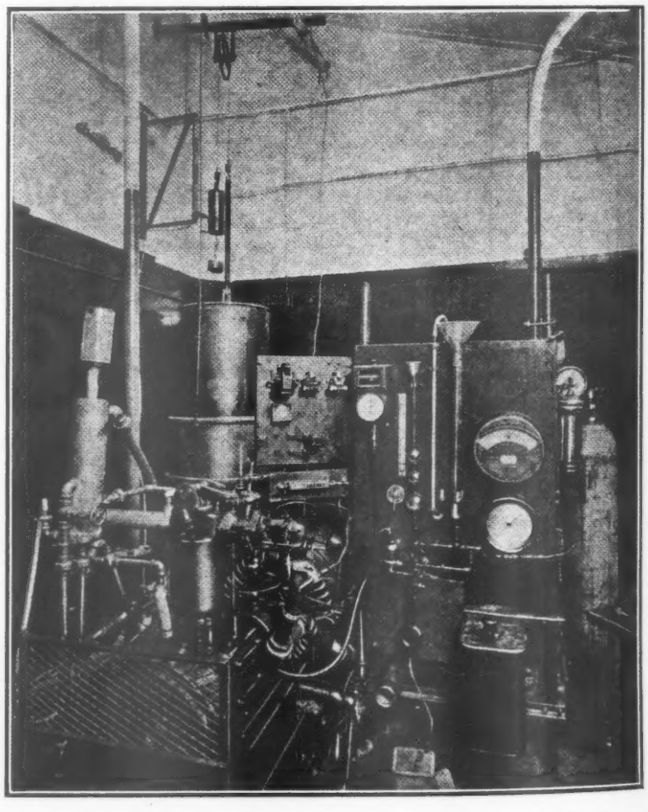

FIGURE 9—SINGLE-CYLINDER ENGINE SETUP USED IN ANTIKNOCK STUDIES OF THE TEXAS COMPANY

A standard steel Liberty airplane-engine cylinder was mounted on a Marine-engine crankcase and the engine speed was limited to 400 r.p.m.

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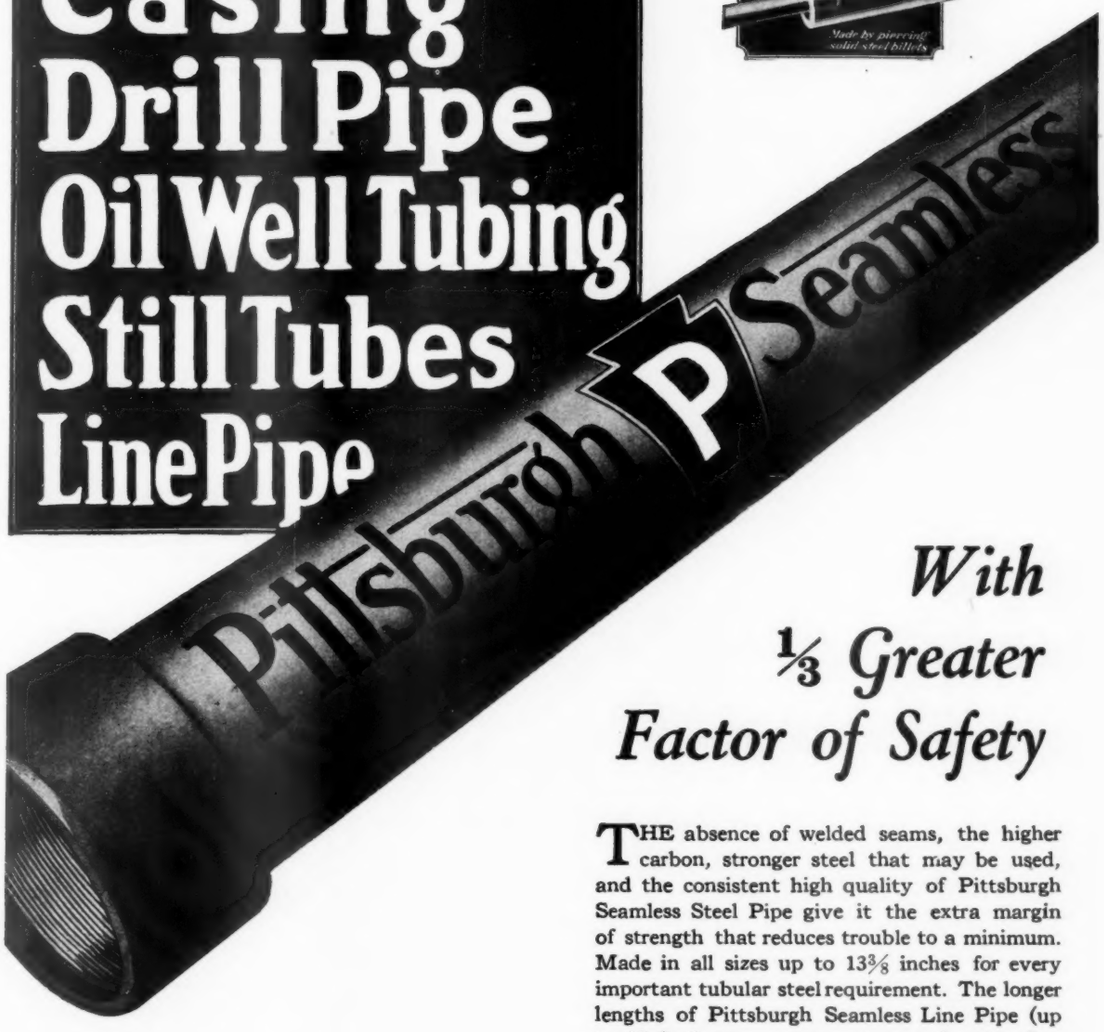

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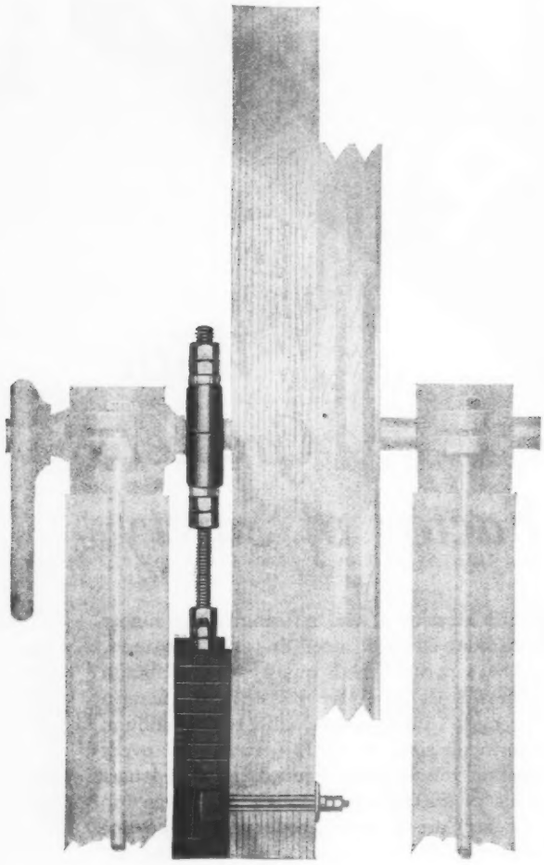

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cosity are involved, it is necessary only to make a single carbureter setting such as that to maintain a uniform fuel flow rate. Unfortunately, no such simple procedure is possible for the fixed-compression engine, which requires a large variation of the throttle position. The effect of fuel viscosity can be seen from the figures in Table 9 for the flow rates of three different fuels with the same carbureter and throttle settings.

TABLE 9
Air-Flow Rates With Same Carbureter and Throttle Settings

Fuel	AK	EK	86-Deg. Naphtha
Time, sec.	249	181	159

Because of the peculiarities of carbureters and the variations of the fuel viscosities, we believe that it will not be possible to co-ordinate satisfactorily the data between various fixed-compression engines unless the same mixture ratio is maintained for all readings. Continual calculation of the mixture-ratio for all readings and readjustments of the carbureter consume much time, but the results obtained warrant the extra time consumed

Consistency of Readings

From the time the engine was put into service, frequent readings of the detonation point were taken for Samples DK and FK. These readings are shown in Figure 11. On the same sheet is also shown the ratio of readings of DK to those of FK, which reveals the fact that whatever causes a variation of the vacuum readings from day to day does not produce an appreciable effect on the ratio of the readings. In other words, this ratio is apparently constant for this engine, irrespective of the barometer or of carbon accumulation.

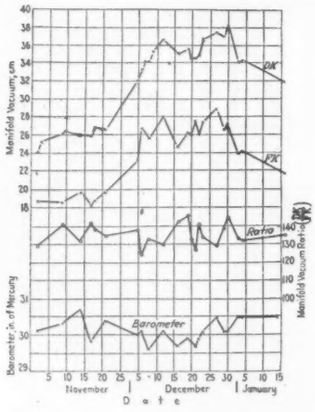


FIGURE 11—READINGS OF THE DETONATION POINT OF SAMPLES DK AND FK

The fact is revealed that the ratio of DK to FK is apparently constant for this engine, irrespective of the variations of daily readings, whether caused by the barometer or by carbon accumulation.

If two reference fuels, such as DK and FK, could be standardized, any engine could be calibrated by determining the value of the ratio between the fuels. It seems, from Table 8, as if this ratio might be constant for all engines; but much more work must be done before such a conclusion would be safe. Many other mechanical factors are known to affect detonation, and we hope to carry on this type of investigation much farther.

A Study of Antiknock Scales

In Figure 12 is shown the effect on the manifold vacuum of adding several knock-suppressing materials. The use of such mixtures as scales to measure the equivalent detonation causes many of the difficulties that arise in correlating results, because of their distorted relation to the factors directly affecting detonation. In other words, doubling the benzol equivalent of a gasoline more than doubles the allowable increase of compression. In greater detail, consider, as an example, gasoline DK as a "low" reference fuel, giving it a scale value of 0, and FK as a "high" reference fuel, to which might be given a scale reading of 100. Imagine a third fuel that will detonate at a compression ratio just half way between these two reference fuels. It probably would fall half way between them on any engine. On our test engine, it would detonate at a point showing 17 per cent increase of ratio. On the benzol scale, this point would correspond to 42 per cent of benzol in DK, which is 71 per cent of the benzol value of FK, that is, 59 per cent. Similarly, tetraethyl lead would have 36 per cent of the FK value. Thus, judging from the benzol scale, one might think that the assumed fuel would be three-quarters as good as DK in the allowable increase of compression, and, from the tetraethyl lead scale, one-third as good, whereas, in reality, it is one-half. This is clearly shown when the values of the fuel samples are compared on the basis of AK and CK, as is done at the conclusion of Tables 4, 5 and 8.

TABLE 10—Summary of Relative Ratings

Method—	From Table No.	Sample BK	DK	EK	FK
Benzol equivalent	4	86	32	86	144
Compression increase	8	77	28	75	130
Tetraethyl lead equivalent	5	74	24	76	347

In every case but one, the benzol values are higher, and the tetraethyl lead values lower, than the compression data. This largely accounts for the great range of values in the comparative columns of Table 3.

It is worthy of note that Figure 12 shows good agreement between the benzol values reported on the bases of manifold vacuum and compression ratio. The curve shown by the solid line represents the benzol percentage in the total mixture, as is customary. The dotted line, which shows the percentage of benzol added to the gasoline DK as 100 per cent, indicates a straight line relation, which, if finally proved to be true, will be a great convenience. The curve for ethyl fluid is somewhat in doubt, since the averages of readings show considerable variation.

Volatility of Reference Gasolines

If it is desired to measure antiknock values in terms of the equivalent mixture of some knock suppressor with a reference fuel volatility is a property that should be borne in mind. Although this is probably not important in single-cylinder engine tests, it is important if such mixtures are to be used to test the antiknock value required by any multi-cylinder engine that is being investigated. The volatility of such mixtures should be the same as that of commercial fuel. Benzol blends fail in this respect, as shown in Table 11.

TABLE 11—Relation of the Percentage of Benzol in Blend to the Mean Boiling Point

Benzol in blend, per cent	0	20	40	60	100
Mean boiling point, degrees Fahrenheit	282	263	248	232	176

The addition of benzol greatly distorts the whole distillation curve. For our own use, we have found that mixtures of DK and FK are very satisfactory in this respect, but they are by no means ideal because of the difficulty of replacing these gasolines with others having the same antiknock values, when our stocks are gone.

Conclusions

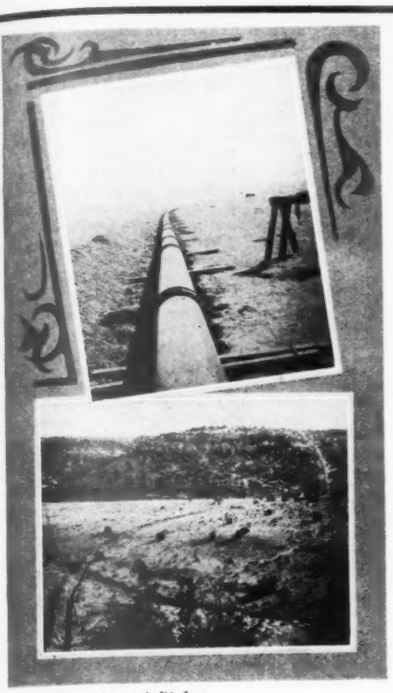
1. There is great need for further development of antiknock measurements.

2. Certain elements of technique, such as the mixture ratio and the spark setting, should be standardized at once.

3. Intensive study should be made of the fundamental methods in use for the direct control of detonation in test engines, such as the compression ratio, manifold vacuum, and the like.

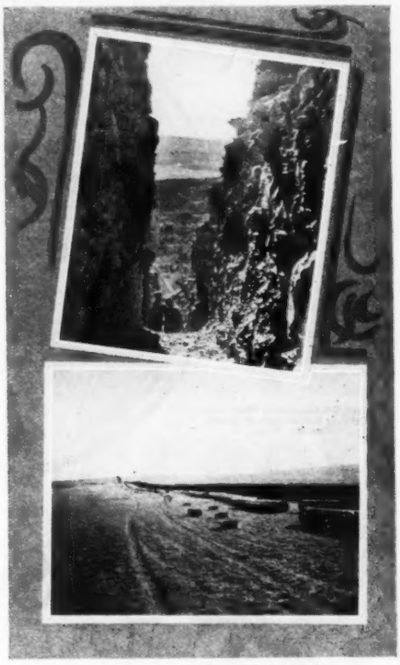
4. Measurement of antiknock values in terms of the mixtures of a reference fuel with benzol or tetraethyl lead is apt to be very misleading if the peculiarities of such scales are not thoroughly understood.

5. The data given in this survey indicate that no great difference in the results probably exists whether the detonation point is determined by audibility



22 in. line 45 miles east of Trinidad, Colorado.

Cut into Long Canon, Union County, New Mexico.



Accompanying illustrations show the type of country encountered in the laying of the Amarillo-Denver Gas Line.

Constructed of 22 inch line from the corner of New Mexico to East of Pueblo, Colorado, at the Arkansas River. North of the Arkansas River 20 inch line into the city of Denver.

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the maximum power, or the bouncing pin.

6. The size and type of engine used apparently does not affect the results.

7. Eventually, a reference fuel of low antiknock value and one of high antiknock value should be standardized.

Recommendations

1. A standard scale for measuring antiknock values should have some direct

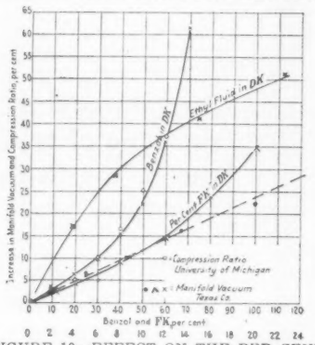
Increase in Manifold Vacuum and Compression Ratio, per cent
Benzol and FK, per cent
Benzol in DK
Fuel Fluid in DK
Tetra Ethyl Fluid in DK
Compression Ratio University of Michigan
Manifold Vacuum Texas Co.

FIGURE 12—EFFECT ON THE PER CENT INCREASE IN MANIFOLD VACUUM OF ADDING SEVERAL KNOCK-SUPPRESSING MATERIALS

Doubling the benzol equivalent of a gasoline more than doubles the allowable increase of compression.

connection with the compression ratio.

2. If all laboratories measured antiknock values in terms of percentage of change in the compression ratio, for variable compression engines, or of manifold vacuum, for fixed-compression engines, the data obtained from any engine might be converted into those obtained from any other engine by the use of a single multiplying constant.

COMMERCIAL GAS FUELS AND CHEMICAL PRINCIPLES

(Continued from Page 119)

gas flame. The Welsbach mantle will thus emit from eight to ten times the light that is given off from an ordinary gas tip burner.

Manufacture of Carbureted Water Gas

The commercial preparation of water gas depends upon the chemical reaction taking place when steam is passed over hot carbon. The gases thus produced are sometimes called "reduction gases" since they are obtained from steam by the reducing action of carbon. Another name frequently applied to the gas is "blue gas," so called because of its characteristic blue flame during combustion. During the process of preparation two types of fuel gases are produced intermittently, namely, water gas and producer gas. Since this latter gas is used as fuel during the preparation of the former, it will be considered briefly here and described more in detail later. Care must be taken, however, not to confuse the two in the discussion which follows.

In actual operation carbon, in the form of coke or anthracite coal, is charged into a generator which is a furnace perhaps 12 feet in diameter and carrying a bed of fuel 6 or 7 feet in depth. The fuel is raised to a point of incandescence by a blast of air supplied under pressure. During this preliminary heating a certain amount of producer gas is formed according to the following equations:

$$C + \tfrac{1}{2}\,O_2 = CO$$
$$CO + \tfrac{1}{2}\,O_2 = CO_2$$
$$C + O_2 = CO_2$$
$$CO_2 + C = 2\,CO$$

This gas, which contains much carbon monoxide, is passed into the carburetor. The carburetor, which is a large fire-brick lined chamber, filled with checker-brick, is brought to the proper temperature, both by the sensible heat of the blast gas and also by the secondary combustion of the carbon monoxide to carbon dioxide.

When the coke and carburetor chamber have both thus been brought to the proper temperature, the air blast is cut off and the steam injected, passing up through the bed of incandescent coke until the temperature falls below 1,800 degrees Fahrenheit. The supply of steam is now cut off and the blast turned on until the fuel is again brought to incandescence when the cycle of operations is repeated.

The reactions occurring between the steam and hot carbon are represented:

$$C + H_2O = CO + H_2$$
$$CO + H_2O = CO_2 + H_2$$

The water gas thus formed consists largely of hydrogen and carbon monoxide together with smaller quantities of carbon dioxide. This mixture, as was previously explained, is an excellent heating fuel but possesses no illuminating value. In order to enrich this gas with suitable illuminating hydrocarbons, it is now carbureted as follows:

Details of Process

From the generator the gas is led into the carburetor. At the same time the carbureting oil is sprayed in and vaporized by the sensible heat of the water gas and by the high temperature of the checker-bricks. A sort of destructive distillation now takes place which is usually referred to as "cracking." The term is well chosen since the heavy hydrocarbons of the carbureting oil are actually cracked into smaller ones. The net result is the conversion of a heavy oil into a set of illuminating gases which mix with the water gas as fixed gases. From the carburetor the gases pass up through the superheater where by the proper regulation of temperature the decomposition is carried to the desired state leading to the maximum yield of illuminating hydrocarbons.

The crude carbureted water gas thus formed is composed of certain fixed gases, some condensible vapors, hydrocarbons and water gas tar. In order to fit the gas for use it is cooled, washed, scrubbed and purified in much the same manner as described in the preparation of coal gas.

The reactions involved in the preparation of carbureted water gas have received a very extensive investigation during the past few years with particular reference to the possibility of increasing the yield of low-boiling hydrocarbons from the enriching oils. The general course of the reactions occurring within the carburetor and superheater resemble those of the third stage of the coal carbonization to a considerable extent. The conditions of temperature and time of contact are, however, under a more rigorous control in the present process.

Two Independent Stages

From the foregoing, it will be noted that the preparation of carbureted water gas really consists of two independent stages, namely, the formation of water gas and the enriching of this gas with suitable illuminating hydrocarbons. The preparation of water gas proper is further divided into two steps—the storage of heat within the fuel bed by the combustion of a portion of the fuel with a blast of air, and the utilization of this heat to bring about the reaction between the steam and hot carbon.

During the preliminary blasting period the following reactions take place:

$$C + \tfrac{1}{2}\,O_2 = CO$$
$$CO + \tfrac{1}{2}\,O_2 = CO_2$$
$$C + O_2 = CO_2$$

The combustion of carbon may thus occur in either one or two steps, both of which form carbon dioxide with the evolution of the same quantity of heat. In the presence of a large excess of hot carbon, however, the dioxide is partially reduced to the monoxide with the absorption of heat:

$$C + CO_2 = 2\,CO$$

The reactions are thus seen to be reversible and as a natural consequence a condition of equilibrium will be established which is influenced by the temperature. This equilibrium may be considered as existing between the carbon monoxide and carbon dioxide so that for any particular temperature the ratio between the two is constant. A careful determination of this constant for various temperatures should, therefore, point to the temperature at which the maximum yield of carbon monoxide may be secured.

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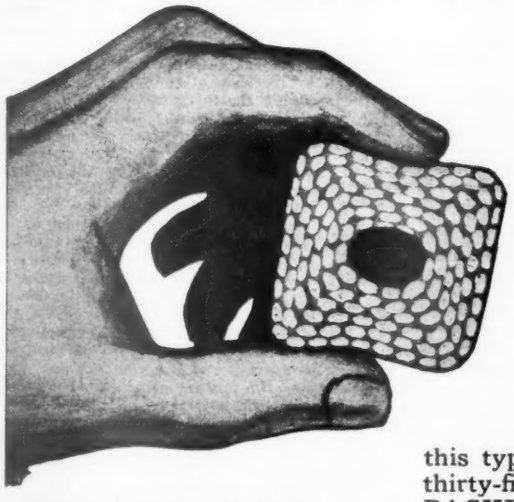

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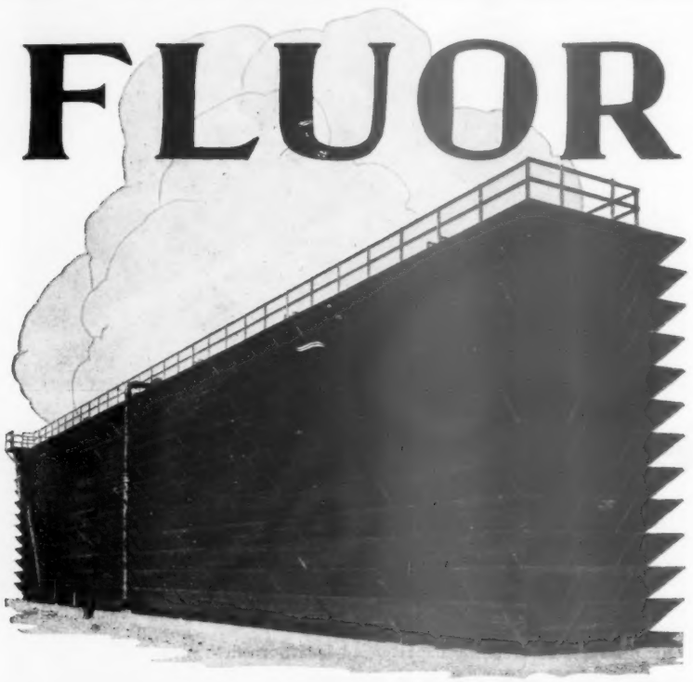

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divided by the square of that of the carbon monoxide is, at equilibrium, a constant, which is, however, a function of the temperature:

$$\frac{p_{co_2}}{(p_{co})^2} = K_1 = f_1(t)$$

The values of this constant for various temperatures are listed in the table below:

Equilibrium Relations Over Carbon
(Pressures in atmospheres.)

Temperature of Carbon °F	$K_1 = \frac{p_{co_2}}{(p_{co})^2}$	$K_2 = \frac{p_{H_2O}}{p_{CO} \cdot p_{H_2}}$
1292	1.37	0.769
1472	0.189	0.165
1652	0.0357	0.0446
1832	0.00855	0.0143
2012	0.00246	0.00524
2192	0.000824	0.00213
2552	0.000129	0.000449

It appears that the reduction of carbon dioxide is practically complete at about 2,000 degrees Fahrenheit. It must be borne in mind, however, that there are also considerable quantities of nitrogen present which alter the theoretical values as given. Despite this fact the data serve as a valuable guide in determining the temperature at which the generator should be operated. Thus Clement and Haskins found that at 2,100 degrees Fahrenheit the equilibrium mixture consists of 99 per cent carbon monoxide and 1 per cent carbon dioxide.

In considering the second step, that of the decomposition of steam by hot carbon, the following reactions are said to occur:

$$C + H_2O = CO + H_2$$
$$C + 2H_2O = CO_2 + 2H_2$$

The carbon dioxide thus formed may again be reduced by the hot carbon as previously shown, or even by the hydrogen now present:

$$CO_2 + C = 2\,CO$$
$$CO_2 + H_2 = CO\,H_2O$$

It is thus apparent that the reversibility of these reactions will set up an equilibrium analagous to that mentioned in the first step. This is even further complicated by the fact that three gases are involved, namely, hydrogen, carbon monoxide and steam. In like manner then, the mass action law requires that

$$\frac{p_{H_2O}}{p_{CO} \cdot p_{H_2}} = K_2 = f_2(t)$$

The values of this second constant (K_2) are included in the table shown above, which are subject to the same sort of qualification as those relating to the first step. It appears that the reduction of steam approximates completion at about the same temperature at which the maximum reduction of carbon dioxide is assured. However, it must be remembered that the theoretical relationships as established are valid only under the condition of a definite equilibrium. This condition of equilibrium is perhaps seldom actually attained in the ordinary operation, owing to the fact that the rate of blast and steam through the fuel does not permit sufficient time for equilibrium to be reached.

Practical Operation

In the practical operation of the water gas formation then, the efficiency will depend upon the temperature and the rate of blast and steam. Since the reduction of the steam and carbon dioxide may be considered as complete at 2,100 degrees Fahrenheit, this, therefore, represents the upper limit of proper temperature regulation. The lower limit may be set at roughly 1,800 degrees Fahrenheit at which 94.5 per cent of carbon monoxide exists in equilibrium. At lower temperatures much undecomposed steam and carbon dioxide will be present in the gas. While the water vapor will largely condense on cooling, the carbon dioxide remains as a fixed gas and acts as an undesirable diluent.

In considering the rate of air blast and steam injection as affecting the time of contact with the hot fuel, it is obvious that the time of contact will vary as the depth of fuel bed. A deep bed naturally results in a larger yield and a more perfect decomposition of the steam. On the other hand, it increases the sensible heat of the blast gases and the water gas and results in an increased percentage of carbon monoxide in the blast gas, both of which are unfavorable to fuel economy.

Increasing the air blast should produce a higher temperature in the fuel as well as in the sensible heat of the blast gases. Also the percentage of carbon monoxide will mount as a result of incomplete combustion. It is further conceivable that at the higher temperatures produced, the endothermic reaction

$$CO_2 + C = 2CO$$

will proceed with the formation of considerable quantities of additional carbon monoxide.

Increasing the rate of steam passage acts favorably in reducing this excessive temperature, but this is more than offset by the appearance of larger quantities of undecomposed steam and carbon dioxide due to resulting chilling. The rate of passage of the steam should thus be so regulated as to insure its practical decomposition by the hot fuel.

The temperature of the generator fuel therefore appears to be the most important factor in the successful preparation of water gas.

Enriching Oils

The oils available for enriching water gas consist of a large variety of crude or semicrude petroleums which may vary rather widely in composition and physical characteristics depending upon the particular field from which they are derived. The oils from the upper Mid-Continent region are composed principally of paraffin and olefine hydrocarbons; those from Oklahoma and Indian Territory also contain much of the paraffins with smaller percentages of double ring compounds called naphthenes. The Texas and California oils, on the other hand, contain very little paraffin, being made up largely of complex hydrogenated ring compounds. The Mexican crudes usually contain too much asphalt to be classed as enriching oils. In addition, there are several varieties of oils resulting from the "cracking" processes. The enriching value of the latter is, however, of smaller order due to the rather high content of aromatic and olefine hydrocarbons.

As enriching agents, it appears that the paraffins are superior to all others, the hydrocarbons possessing unsaturated linkages following next. Of the ring type oils, the more fully hydrogenated are generally considered preferable.

As has been previously stated, the decomposition of the enriching oils in the fixing chambers follows along the same lines as the third stage of the carbonization of coal. In the present process high temperatures likewise result in increased per centage of hydrogen while the illuminants rise to a maximum and then slowly decline. Although the candle feet delivered from a gallon of enriching oil will vary with the character of the oil, a typical paraffin can be made to produce about 6,000 candle feet per gallon when the fixing chambers are carefully maintained at 1,250 degrees Fahrenheit. The yield at both lower and higher temperatures is diminished so that this represents the temperature of maximum efficiency where paraffin oils are employed. (See table for composition.)

Difficulties Overcome

It would seem that even the casual observer could not fail to be impressed with the intricacy and complexity of the carbureted water gas preparation. However, by the aid of the chemist and engineer many of the difficulties encountered have been overcome. The industry in its present form represents a highly scientific and efficient process as every feature has been carefully considered, both from a theoretical and an operative standpoint. The coke is carefully selected and weighted; the supply of air and steam is accurately metered; the temperatures in the geneator and fixing chambers are rigorously controlled with electrical pyrometers; the sensible heat of the issuing blast gases is largely recovered in suitable economizer boilers to generate sufficient steam to operate the plant; in general every condition leading to increased economy and yield of gas has been

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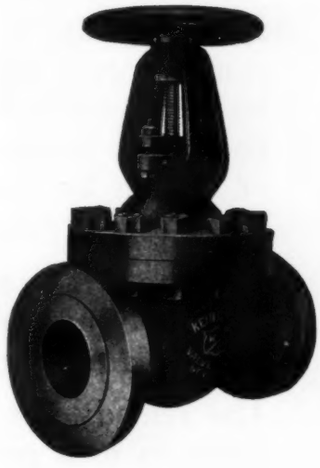

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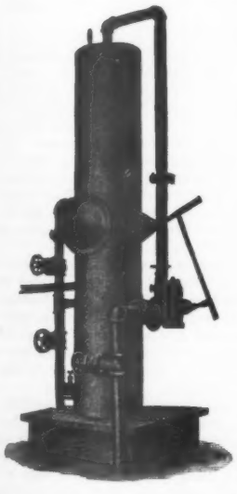

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introduced with the result that plants are at present capable of producing 3,000,000 cubic feet of water gas daily.

Producer Gas

Although the preparation of producer gas has been briefly referred to in the previous section, a more complete treatment will now be considered. It will be recalled that the producer gas was formed incidental to the actual preparation of the water gas proper. During the preliminary heating of the fuel in the generator the blast forms a considerable quantity of carbon monoxide which is employed to generate steam and to maintain the carburetor and fixing chambers at the proper temperature. The formation of this carbon monoxide is not peculiar to this particular process, but applies to the combustion of all carbonaceous fuels in general. The heating engineer always strives by proper regulation of operating conditions to prevent the formation of this gas since the presence of carbon monoxide in the blue gases is generally looked upon as loss of heat resulting from incomplete combustion. Obviously, this is true when the blue gases are permitted to escape through the stack. However, carbon monoxide is, in itself, a valuable fuel and capable of further combustion with the production of additional heat. The combustion of carbon may thus take place in either one or two steps as shown in the following equations:

$$C+1/2\,O_2=CO+4{,}380\ \text{B.t.u.}$$

$$CO+1/2\,O_2=CO_2+10{,}160\ \text{B.t.u.}$$

$$C+O_2=CO_2+14{,}540\ \text{B.t.u.}$$

The equations also indicate that the heat of combustion of carbon to carbon dioxide is 14,540 B.t.u. per pound regardless of the manner of its combustion. It is to be noted, further, that the secondary combustion of carbon monoxide to the dioxide produces more than two-thirds of this total quantity of heat. On the other hand, the primary combustion of carbon to carbon monoxide accounts for less than one-third of this total heat, thus presenting ample justification for the engineer's unwholesome regard for carbon monoxide in the chimney gases. This unfavorable opinion is not shared by the water gas engineer, however, since the secondary heat of combustion is utilized in heating the carburetor and fixing chamber.

Study of Reactions

A study of the reactions occurring throughout a bed of coal or coke will perhaps best illustrate how the general course of the combustion proceeds.

In as much as the air for combustion is led in beneath the grate, the fuel at the base of the bed will burn largely to carbon dioxide with the consumption of most of the available air. The upper layer will consequently be heated to incandescence without actually burning to any considerable extent. The hot carbon now reacts with the carbon dioxide, passing up through it producing carbon monoxide:

$$C+CO_2=CO_2—5{,}810\ \text{B.t.u.}$$

The heat thus released in the initial combustion of the lower layer is utilized in the formation of carbon monoxide in the upper layer. The presence of this gas can always be recognized by its characteristic blue flame directly above the fuel bed. The amount of this carbon monoxide formation is, of course, dependent upon the temperature, depth of bed, rate of air blast and time of contact as discussed fully under the water gas preparation. It, therefore, appears feasible that by a deliberate regulation of these conditions, the carbon monoxide may be formed in sufficient quantity so as to serve as a valuable gas fuel for industrial heating. This is precisely what is done during the preliminary heating period of the water gas manufacture. Since air alone is used during its formation, the producer gas thus made is more generally called simply "air gas." However, owing to the presence of considerable incombustible nitrogen, its heating value is too low to justify its preparation on an independent scale. A more general practice is to combine the two stages of the water gas preparation, thus making of it a continuous process instead of an intermittent one. Accordingly, the air and steam are admitted together, being so regulated that the heat combustion of the fuel by means of air just compensates the heat of formation of the water gas. The producer gas thus obtained is, however, more strictly a semiwater gas. Like the air gas it also contains much free nitrogen and, while its heating value is higher than that of air gas, it still has the lowest calorific value of all other gas fuels. Despite this fact, it is a cheap fuel and has found large commercial use because of its simplicity of preparation and also because of the fact that almost any solid fuel can be converted in a gaseous fuel in the producer. With specially designed generators peat, wood, bituminous slack and various other combustibles, including garbage, may be employed in place of coke. Moreover, because of its nitrogen content, producer gas will be incapable of furnishing high temperatures. Still, with but a slight excess of air, it can be burned with practically 100 per cent combustion efficiency. As in the water gas preparation, much of the sensible heat of the gas can be recovered and utilized in the generation of steam, or preheating the air. Producer gas possesses the added economy in that it can be generated in small units of the Siemens and Taylor types for use in small scale consumption.

Another type of producer gas which should be mentioned in this connection is blast furnace gas. During the smelting of iron and other ores in the blast furnace, the waste gases contain about 30 per cent carbon monoxide and 58 to 60 per cent of nitrogen. The blast furnace may, therefore, be regarded as a huge producer, while the blast furnace gas is more strictly an air gas. The gas is used in preheating the blast air, driving blowers and converters, as well as for fuel in gas engines.

All Oil Water Gas

Another gas fuel directly related to carbureted water gas is the so-called all oil water gas. This type of gas fuel is extensively manufactured on the Pacific Coast where an abundance of cheap fuel oil is to be found.

The apparatus employed consists of two fire-brick lined chambers, the smaller one serving as a primary generator while the larger serves as a superheater. Both of these chambers are filled with checker-brick and provided with suitable spraying nozzles and delivery tubes for the admission of steam and oil and the withdrawal of the illuminating gas, respectively.

In the operation of the set, oil and steam are sprayed into the primary generator simulatenously along with the blast. This heating period usually continues for about 12 minutes during which the oil is burned in bringing the chambers to the proper temperature. At the end of this time the blast is cut off and the gas-making oil and steam injected as before. The gas-making oil nozzles are located in both chambers although the oil is sprayed into the superheater at a much slower rate.

The main features of the process thus appear to resemble the carbureted water gas preparation, the chief difference being that oil alone is used as both the heating fuel and source of the enriching illuminants. Actually about 16 per cent of the total oil used is burned during the heating run.

The gas thus produced, however, resembles coal gas more closely than it does water gas, as shown in the table. The theory of its formation is almost identical with the last two stages of the coal distillation, so that any additional discussion as regards its formation would be but a repetition of what has been previously stated.

The all oil gas process has the distinct advantages of being relatively simple in design, can be built in large units, and runs at a low operating cost. The apparatus also produces a continuous supply of gas thus eliminating the expense of high capacity holders.

Pintsch Gas and Blau Gas

The two gases known as Pintsch and Blau gas are the result of attempts made to compress illuminating gas so as to facilitate its transportation for use in inns, country homes and life buoys, as

well as on railway passenger cars. The use of these gases has, however, been largely superseded by more modern means of illumination. Although more or less obsolete they possess some interest in that they are straight oil gases, obtained by "cracking" certain petroleum, tar and shale oils in suitable retorts. The crude gas must be carefully purified after which it is compressed into storage cylinders. In the preparation of Pintsch gas every precaution is taken to remove the condensed liquids thrown down during the compression, so that the gas in the cylinders will be thoroughly dry. The pressure seldom is more than 14 atmospheres and is often as low as 12.

In the Blau gas preparation the gas is compressed to 100 atmospheres, so that the greater portion of it liquefies. Under this high pressure the liquid hydrocarbons dissolve and retain much of the fixed gases otherwise uncondensed. The liquid is then charged into steel cylinders while the residual unabsorbed gas is used in gas engines to drive the compressors. One gallon of the liquefied gas will yield about 28 cubic feet of expanded gas.

Both of these gases are nearly free from carbon monoxide and consist essentially of methane, ethane and related hydrocarbons which impart to them a high calorific power as well as high illuminating value. For this reason, they have been used to enrich other gases poor in illuminants. The use of these gases for lighting requires a special type of burner, otherwise it is liable to smoke or deposit soot. Burning with pure oxygen improves the combusion and illuminating power, thus furnishing sufficient heat so as to be useful in welding and metal cutting.

Acetlyene

Through the recent developments of the electric furnace many carbides (compounds of carbon and metals) have been produced. The direct application of these carbides lies in the fact that they react with water, forming hydrocarbons such as methane, ethylene and acetylene. The only carbide of industrial importance is that of calcium from which acetylene is obtained.

Calcium carbide is formed when coke and lime are heated together at the high temperature in the electric furnace. After removal from the furnace it is crushed, sized and packed in hermetically sealed cans. Calcium carbide is a hard, crystalline substance, inert when dry and nonexplosive when attacked by fire. Its odor is due to traces of acetylene resulting from the action of moisture. While the amount of acetylene produced varies with the size of particle, it usually runs about 5 cubic feet per pound of carbide.

As shown in the following equation, calcium carbide reacts with water with the formation of acetylene and lime water.

$$CaC_2 + 2H_2O = C_2H_2\,Ca(OH)_2$$

Pure acetylene has a specific gravity of .9056; its critical temperature is 96.6 degrees Fahrenheit and its critical pressure 68 atmospheres. The specific heat is .373, while its heat value is 1,440 B.t.u. per cubic foot. When mixed with air it ignites at 800 degrees Fahrenheit.

Solubility of Acetylene

As heavily compressed acetylene is liable to explode, storage in steel tanks is extremely dangerous, and thus prohibited. This danger has been largely overcome by dissolving the gas in suitable solvents as under this condition the solution is nonexplosive. The solubility of acetylene in various solvents is given in the table below and is expressed in volumes of gas dissolved by 100 volumes of solvent under atmospheric pressure, and at the temperature given:

Solvent—	Temp. Degrees F.	Solubility of Acetylene
Acetone	60	2,500
Acetone	122	1,250
Alcohol (ethyl)	64	600
Chloroform	64	400
Paraffin oil	64	150
Water	64	106

Since the solubility of a gas in a liquid increases with pressure, this method serves as a very satisfactory means of storing and transporting acetylene with comparative safety. The tanks are usually filled with some porous material, as charcoal, asbestos, infusorial earth, unglazed blick, etc., containing about 80 per cent of voids, of which about 43 per cent are filled with acetone. The acetylene is then charged into the cylinder under a pressure of 10 atmospheres. The cylinder under these conditions will hold about 100 times its volume of acetylene.

Acetylene is used to a considerable extent for illuminating country homes, hotels, factories and even towns lying remote from a direct gas supply. The light produced is soft and white, closely resembling that of sunlight.

The chief interest of acetylene is in its use for cutting and welding. When pure oxygen and acetylene are mixed in the proper proportion, a temperature of over 4,000 degrees Fahreheit can be secured. Owing to its relatively high cost, it is little used as a fuel.

Combustion of Gas Fuels

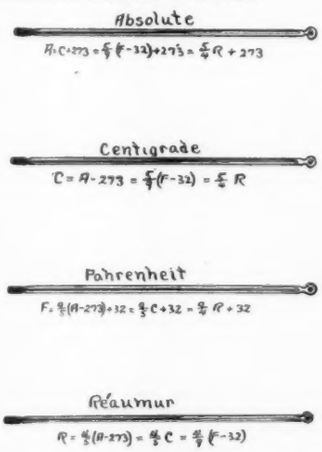
The investigation of any class of fuels can hardly be considered complete which is concerned solely with the origin, preparation and composition of these fuels. While the composition of a gas fuel serves as an excellent guide in determining its calorific content, it is only with the actual combustion of a fuel that its value and usefulness can be accurately ascertained. The remainder of this paper will, therefore, be devoted to a brief discussion of combustion as pertaining to gas fuels.

Considered from an industrial standpoint, combustion consists of the burning of a fuel by means of air with the production of available heat or also light. Since a combustion cannot proceed in the absence of oxygen, it is perhaps more exactly defined as the chemical combination of a fuel with the oxygen of the air; the nitrogen taking no part in the change. Every combustible substance has a temperature to which it must be brought before it will unite with oxygen and below which combustion will not occur. This temperature is called its "kindling," or perhaps better, its "ignition temperature." Therefore, in order to initiate a combustion, the fuel and air must be brought into intimate contact and to its ignition temperature. The combustion once started will usually evolve sufficient heat to maintain itself.

The economic value of a combustion is made up of two factors: (1) Its intensity and (2) the quantity of heat produced.

Thermometric Scales

The temperature or calorific intensity of a combustion is measured in degrees as read from various thermometers and pyrometers. Unfortunately, there are in use at the present time four thermometric scales where one would suffice. These scales are known as Absolute, Centigrade, Fahrenheit and Reaumur. Considering the freezing and boiling temperatures of pure water under standard conditions as points of reference, these scales are shown in the figure below. The appended formulue are useful in converting temperatures from one scale to another.


Absolute
A = C + 273 = 5/9 (F - 32) + 273 = 5/9 R + 273
Centigrade
C = A - 273 = 5/9 (F - 32) = 5/9 R
Fahrenheit
F = 9/5 (A - 273) + 32 = 9/5 C + 32 = 9/5 R + 32
Reaumur
R = 4/5 (A - 273) = 4/5 C = 4/9 (F - 32)

Since the above thermometers all contain mercury which boils at 676 degrees Fahrenheit under atmospheric pressure, they will only serve for the measurement of low or moderate temperatures. Higher temperatures require the use of

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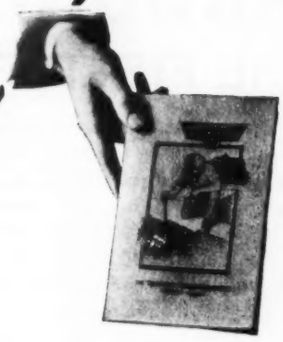

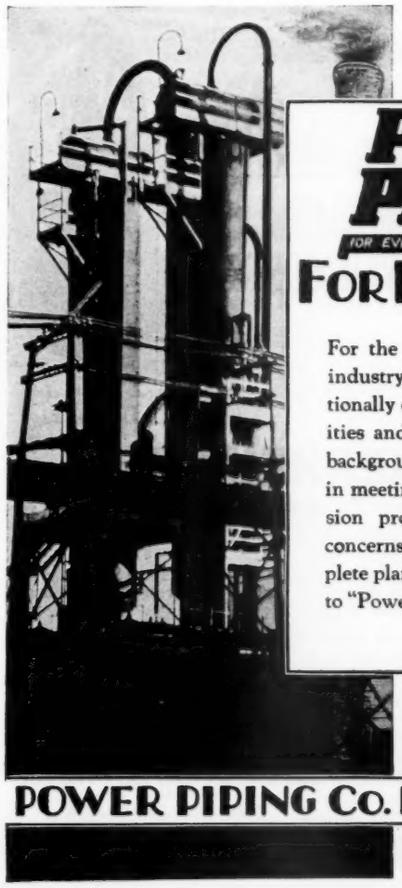

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some sort of pyrometer such as the optical, resistance, radiation or thermoelectric type.

The amount of heat produced by a combustion is either expressed in calories per gram or British thermal units per pound of fuel. The British thermal unit, which is most employed in industrial work, is the amount of heat necessary to raise 1 pound of pure water from 60 degrees Fahrenheit to 61 degrees Fahrenheit. In scientific work it is more customary to express quantity of heat in calories. A calorie represents the amount of heat required to raise the temperature of 1 gram of pure water from 15 degrees Centigrade to 16 degrees Centigrade. A calorie (or "large calorie") is 1,000 times this amount. A calorie per gram (or calorie per kilogram) is therefore equivalent to 1.8 B.t.u. per pound. Also, since 1 kilogram is equal to 2.2046 pounds and 1 degree Centigrade equals 9/5 degree Fahrenheit, a calorie will be equivalent to 3.968 B.t.u.

The actual determination of the calorific power of a fuel may be accomplished in either of two ways. The heat of combustion may be (1) determined accurately from the temperature produced by the combustion of a weighed quantity of fuel in a calorimeter, or (2) it may be computed approximately from the results of a chemical analysis of the fuel and the individual heats of combustion of the elements which go to make up the fuel.

Calorimeters Employed

The calorimeters employed for the determination of heats of combustion of fuels may vary greatly in construction and manner of manipulation, but in general they consist of a combustion chamber equipped with the necessary means for supplying oxygen and a device for firing the fuel. The heat liberated during the combustion is radiated to a bath of water in which the whole is immersed. The heat of combustion is then computed from the weight of sample taken and the rise of temperature produced in the bath as read from a thermometer.

Since the determination of the theoretical heat value of a gas fuel is based on individual heat values of the elements of which the fuel is composed, this method will be deferred until later.

The table of elements and compounds encountered in commercial combustion work together with their physical data and reactions are given below:

Substance—	Molecular or Atomic Symbol	Form	Molecular Weight	Ignition Temp. °F.	Chemical Reaction
Carbon	C	Solid	12.005	900	$2C+O_2=2CO$ $2C+O_2=CO_2$
Hydrogen	H_2	Gas	*2.016	1,130	$2H_2+O_2=2H_2O$
Oxygen	O_2	Gas	*32.00	.....	
Sulphur	S	Solid	32.07	470	$S+O_2=SO_2$
Nitrogen	N_2	Gas	28.02	.....	
Carbon Monoxide	CO	Gas	28.01	1,210	$2CO+O_2=2CO_2$
Carbon Dioxide	CO_2	Gas	44.01	.....	
Methane	CH_4	Gas	16.03	1,202	$CH_4+2O_2=CO_2+2H_2O$
Acetylene	C_2H_2	Gas	26.03	900	$2C_2H_2+5O_2=4CO_2+2H_2O$
Ethylene	C_2H_4	Gas	28.03	1,022	$C_2H_4+3O_2=2CO_2+2H_2O$
Ethane	C_2H_6	Gas	30.05	1,000	$2C_2H_6+7O_2=4CO_2+6H_2O$
Sulphur Dioxide	SO_2	Gas	64.07	.....	
Hydrogen Sulphide	H_2S	Gas	34.08	.....	$2H_2S+3O_2=2H_2O+2SO_2$
Water vapor	H_2O	Vapor	18.02	.....	
Air	Mixture	Gas	28.94 (calculated)	.....	

*Atomic weight equals one-half molecular weight.

Chemical Reaction

In the foregoing more or less abstract consideration of combustion, it was implied that there was present a supply of oxygen sufficient for the complete combustion of the fuel and that the temperature was brought to the ignition temperature of the fuel. However, in actual practice it is the physical introduction of oxygen into intimate contact with the fuel in such a manner so as to insure complete oxidation with no excess of oxygen, that presents the most difficult problem in the burning of fuels.

The chemical reaction of combustion, like all chemical reactions, takes place in accordance with fixed and invariable weight relations which may be stated thus: when oxygen and a fuel substance combine, they do so in a definite and invariable proportion by weight. In case the substances reacting and produced are all gases, the following relation holds: the volumes of the gases reacting and produced during a chemical change are expressible in the ratio of small whole numbers.

From the nature of chemical combination it follows, therefore, that when two elements, carbon and oxygen react to form a compound in a definite ratio—let us suppose 1 atom of carbon unites with 1 atom of oxygen to form carbon monoxide—then the weights of the reacting carbon and oxygen must be in the ratio of the actual weights of their individual atoms.

While the actual weights of individual atoms are not known, their relative weights have all been carefully determined and serve our purpose equally well. These values are given in the preceding table under the column headed "molecular weights." Knowing the atomic weights, it is a fairly simple task to calculate the weight of oxygen which must be supplied to completely burn a given weight of carbon to carbon monoxide. The method is clearly indicated by example, and since the efficiency of a combustion depends on the proper mixture of fuel and oxygen, it appears advisable to illustrate the scheme in detail.

Combustion of Carbon

Let us consider again the combustion of carbon to carbon monoxide:

$$C - O = CO$$
$$(12) \quad (16) \quad (12+16)$$

The equation shows that one atom of carbon reacts with one atom of oxygen to form one molecule of carbon monoxide. Considering the atomic weights written beneath the symbols, the equation signifies that 12 parts or pounds of carbon react with 16 pounds of oxygen to form 28 pounds of carbon monoxide. Since the ratio of the weights of carbon and oxygen are 12 to 16, or 1 to 1.334, it follows that the combustion of 1 pound of carbon completely to carbon monoxide will require exactly 1.334 pounds of oxygen. The carbon monoxide is capable of further combination with oxygen to form carbon dioxide, or the carbon may in the presence of sufficient oxygen combine directly with two atoms of oxygen to form carbon dioxide:

$$C + 2O = CO_2$$
$$12 - 2(16) = 12 + 2(16)$$

In like manner this equation shows that 12 pounds of carbon react with 32 pounds of oxygen to form 44 pounds of carbon dioxide. The ratio of carbon to oxygen is in this instance 12 to 32, or 1 to 2.667, thus signifying that in order to burn 1 pound of carbon completely to carbon dioxide 2.667 pounds of air are required. The calculation of other fuel-air ratios may be done in precisely the same way.

Since it is assumed in the above relations that the oxygen supplied is pure oxygen, corrections must be made when air is supplied as a source of oxygen. Air consists of a mixture of 23.15 per cent oxygen and 76.85 per cent nitrogen. Therefore, in order to supply 1 pound of oxygen for combustion, it is necessary to supply $1 \div .2315 = 4.320$ pounds of air. The admission of 3.320 pounds of nitrogen, however, serves no useful purpose in the combustion and represents a direct loss in combustion work. Entering with the oxygen, it passes through the combustion unchanged, except that it has absorbed much valuable heat. A further objection is that it dilutes the oxygen and so retards the rate of combustion of the fuel.

Excess of Oxygen

In an analogous fashion any oxygen supplied in excess of that utilized during the combustion results in the same losses as in the case of nitrogen. For the equations to be written as given in the foregoing table, therefore, it is necessary that the oxygen supplied be the exact amount required and be wholly util-

ined, so that the combustion will be both complete and perfect. A combustion may be complete even in the presence of an excess of oxygen over that actually required. However, combustion is only perfect when complete and when the products of combustion contain no unused oxygen. An insufficiency of oxygen, on the other hand, will result in unburned fuel in the flue gases, thus representing a loss of valuable fuel as well as the heat it might have produced if burned.

In the table below are given the important components of commercial gas fuels and their combustion data.

Name—	Weight per Cu. Ft. Lbs.	Specific Heat	Heating Value B.t.u. per Cu. Ft.	Heat of Formation B.t.u. per Lb.	Air Required for Combustion Cu. Ft. per Cu. Ft.	Air Required for Combustion Lbs. per Lb.
Benzene	.20640	.3754	3,700.3	—229.3	35.883	13.313
Ethylene	.07410	.4040	1,588.9	—174.2	14.355	14.836
Hydrogen	.00530	3.4090	324.3	.....	2.393	34.624
Carbon monoxide	.07497	.2450	322.6	+1,869.2	2.692	32.471
Methane	.04234	.5929	1,009.0	+2,435.6	9.570	17.312
Ethane	.07940	.7070	1,764.4	+1,713.6	16.748	16.156
Carbon dioxide	.11637	.2163	.....	+3,979.1	.....	.....
Oxygen	.08463	.2174	.....	.....	.....	.....
Nitrogen	.07429	.2438	.....	.....	.....	.....
Air	.07668	.2374	.....	.....	.....	.....
Steam	.04741	.4805	.....	+6,870.4	.....	.....
Hydrogen sulphide	.best12	.2423	672.2	+250.9	7.178	6.111
Ammonia	.04509	.5083	432.8	+1,259.0	3.589	6.111
Carbon disulphide	.20139	.1590	1,264.6	—6,160.0	14.355	5.466

The data given are calculated to 60 degrees Fahrenheit and 30.0 inches Barometer.

From the data presented in the preceding table, formulas may be constructed for the amount of air theoretically required for the combustion of various fuels.

The following formula will serve as an excellent means of determining the theoretical amount of air required in the combustion of a gas fuel containing a mixture of the simple gases and hydrocarbons:

Pounds of Air Required Per Pound of Fuel = $2.46CO+34.56\,H_2+17.28\,CH_4+13.29\,C_2H_2+14.81\,C_2H_4+16.13\,C_2H_6+6.10\,H_2S-4.32\,O_2$

Where CO, H_2, CH_4, C_2H_2, C_2H_4, C_2H_6, H_2S and O_2 represent the percentages by weight of carbon monoxide, hydrogen, methane, acetylene, ethylene, ethane, hydrogen sulphide and oxygen, respectively, as determined by ultimate analysis.

In considering the heating values as given in the preceduing table, it must be borne in mind that the values are those obtained from calorimetric methods where the combustion is perfect. This method, therefore, represents the ideal method in that it is reliable. The heat values of gaseous fuels may, however, be calculated with a fair degree of accuracy in the following manner.

Let us assume that a commercial gas fuel has the volumetric analysis as given below.

	Volume per cu.ft.	Per Cent by weight	Weight per pound		B.t.u. per pound		B.t.u.
CO	0.0045	0 762	0.00762	×	4,380	=	33
H_2	0 0183	0 221	0 00221	×	62,000	=	137
CH_4	0 9233	91.188	0 91188	×	23,850	=	21,748
C_2H_4	0 0025	0 423	0 00423	×	21,460	=	91
H_2S	0 0018	0 376	0.00376	×	7,458	=	28
O_2	0 0035	0 677	.....		.....		.....
CO_2	0 0022	0.591	.....		.....		.....
N_2	0.0340	5.762	.....		.....		.....
Total B.t.u. per pound							=22,037

The gas in question, under standard conditions, weighs 0.046058 pound per cubic foot and the heat value per cubic foot is thus:

$$22{,}037 \quad 0.46058 = 1{,}015 \text{ B.t.u.}$$

This maximum heat of combustion can never be realized in actual practice owing to the various heat losses by radiation, stack and so forth. Perhaps the most important cause of reduced combustion efficiency is due to improper mixture of air and fuel. In the case of solid fuels where ash tends to collect this difficulty is not easily overcome. Combustion of gas fuels, however, presents the least difficulty in that both the air and fuel are gases, hence can be accurately metered so as to maintain the proper fuel-air ratio. The combustion of gas fuels, therefore, can be subjected to a more exact control than is found in the case of either solid or liquid fuels.

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BURNING GAS WELL IS FINALLY SUBDUED

AUSTIN, Tex., May 5.—One of the most unusual instances of man's triumph over the force of nature on rampage is given in the report of Leslie McKay, chief deputy oil and gas supervisor for the State, of having subdued the No. 7 Rachal gas well of the Saxet company in the White Point Field. This well had been in flames for weeks, flowing millions of feet of gas. It had blown a crater over 100 feet across and over 80 feet deep, around the well, and has melted or broken off the three strings of pipe at the bottom of this crater. The gas was flowing out at the bottom of the crater under force of several hundred pounds per square inch, and repeatedly caught fire there, 80 feet below the surface. Efforts to pump water into the well at the bottom, through the gas sand stratum, had failed to cut down the pressure of escaping gas.

The flames were put out without particular difficulty, though they threatened to flash up again at any time from sparks or from the peculiar "blue haze" about the well which had mystified gas experts.

A cable was stretched across the top of the crater. Men were lowered by lifelines to the bottom. They went without gas masks, since the gas was "sweet" and nonpoisonous. Crews held the lifelines, to pull them out quickly as they became drowsy from the fumes.

Heat of the fire had fused the sand into rocklike masses around the pipe. Pipe broken off, valves and twisted steel were massed around the wall.

This was pulled away. A pipe, larger than the casing, with open valves at the top, was lowered over the broken top of the casing in the well. With lead seals and clamps a joint was secured, forcing the gas to flow through to above the surface of the ground. One thousand sacks of cement was used to case up this joint.

The pressure had been great enough to cause a 2 inch siphon pipe inside the casing to bob up, endwise, above the mouth of the well from time to time, then drop back far out of sight into the well.

A high-pressure pump was connected with the valves at the top of the casing put on the well, and the entire 2,250 feet of the well pumped full of water. Then, when the gas was finally held down, the hole was pumped full of mud, sealing it permanently.

Despite the waste of millions of feet of gas daily for several weeks, the pressure was as high when the well was controlled as when it blew in.

Over $30,000 was spent to bring the well under control. The wastage would finally have exhausted the gas supply over a large area had the well stayed open. Now this gas can be recovered from other nearby wells.

Mr. McKay was assisted in the work by John Bartlett, superintendent for the Saxet company and Cecil Best, who was engaged in the actual work of subduing the well.

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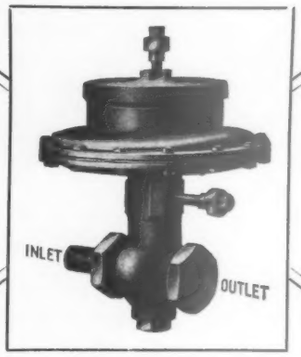

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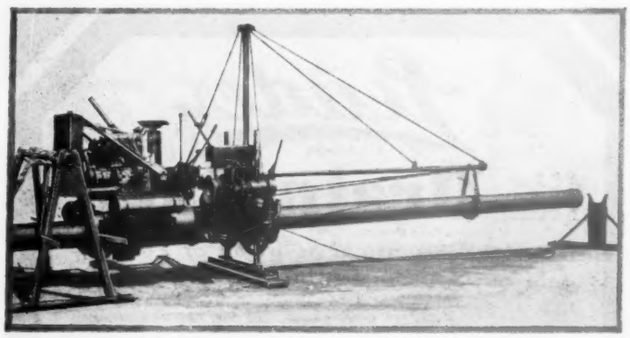

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NEW CAST PIPE IS EXPECTED TO HELP MEET CORROSION PROBLEM

By Gray I. Morriss*

Recent developments in foundry practice have made it possible to produce cast pipe that can be cut and threaded at any place within its own length, maintaining the same inside diameter and outside diameter as extra-heavy steel or wrought pipe. Thus the new cast pipe, made up with standard threaded fittings, can be installed. The tests on this pipe are confirmatory of statements made by technical men at the refineries, that the physical structure of the cast iron is more important than the analysis in meeting and resisting corrosion.

By the use of special moulds and cores, the castings are of a semipearlitic structure and are free from heat strains or chills. The standard test bar (1 inch by 1 inch by 13 inches) has shown a breaking pressure (Transverse test) in excess of 3,000 pounds. The pipe weighs less than extra-heavy steel pipe, ranging from 3.17 pounds per foot on the 1½-inch size, to 26.33 pounds per foot for the 6-inch size.

All pipe is tested at 1,000 pounds cold water pressure before leaving the plant. No plugs are used. All full lengths of pipe are threaded at each end and each short length at one end, with Briggs standard threads and conform to the American standard. Each thread is also gauged as to length of thread on the pipe with a tolerance of one thread, plus or minus. This pipe has been tested to destruction with the following results:

1½-inch bursting pressure	4,000 pounds
2-inch bursting pressure	4,050 pounds
3-inch bursting pressure	3,800 pounds
4-inch bursting pressure	3,050 pounds

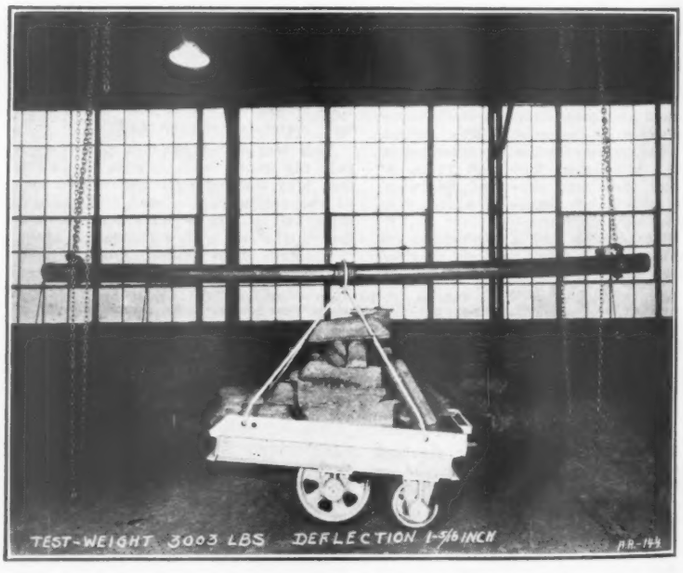
Eight of the 6-foot lengths of this pipe were made up with the couplings of the same material, giving a total over-all length of approximately 49 feet. This length of pipe was supported approximately 6 inches from the end and showed a deflection of 16¼ inches. With a weight of approximately 170 pounds, carried in the center of the pipe, the deflection was increased to approximately 24 inches.

The accompanying picture shows two 6-foot joints of the pipe supported on 11-foot centers carrying a load of 3,003 pounds with a deflection of 1 5/16 inches. In a deflection test on the pipe, using single joints supported 3 inches from the end giving a center-to-center measurement of 5 feet 6 inches, the 1½-inch pipe showed a deflection of 1¾ inches before breaking. The 4-inch pipe showed a deflection of fifteen-sixteenths of an inch before breaking. In each deflection test, the pipe was turned 180 degrees after the first deflection test and in each case the pipe came back to perfect alignment.

This pipe has been installed on run-down lines, contact plant lines, acid sludge lines, water and steam lines and used as connections around the continuous treating plants with uniform success.

In view of the test for strength, care in casting, improved physical structure of the iron used in manufacturing, and the generally satisfactory results obtained from cast material in corrosion resistance, it is believed that this new pipe will give improved service under corrosive conditions.

*Manager Illinois plant American Radiator Co., Springfield, Ill.



Would Extend Tribal Control of Osage Oil Leasing Until 1958

By Charles E. Kern

Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., May 5.—The House Committee on Indian Affairs debated the bill to extend the period the tribal relation will control the leasing of Osage oil lands and ended by adopting a provision extending the period of tribal relation from 1931 to 1958 on the theory that by the time this tribal relation is severed every living Indian infant will be old enough to take care of its interest, then to be received in severalty.

Representative Howard of Oklahoma was insistent upon extending the tribal relation only until 1946, the reported bill extending it until 1972, and he declared that it was the white man who really was behind the 1972 extension and not the Indian. He said it was questionable whether the white farmer who had acquired rights to the oil in Indian land would be entitled to anything after 1931 when the tribal relation expires under existing law.

"Personally I do not think they are," he declared, addressing the House Indian Affairs Committee, "but there will be law suits in 1931 to determine the question."

There would be an opportunity, he said, to take care of tribal relations in 1946 and it was not necessary to provide for their continuance for an additional period of 40 years.

Representative Knutson finally suggested the compromise for fixing the date as of 1946 and that was agreed to by a vote of the committee. No further action was taken on the bill.

NATURAL GAS KNOWN FOR CENTURIES USED BY CHINESE IN REED PIPES

Gas has been known for many centuries. The Chinese utilized it as early as 900 A. D., using reed pipes for gas mains. The short period of progressiveness was brought to a sharp close, however, with the overthrow of the dynasty and the reversion to barbaric customs. S. J. Magee, writing in the Associated Magazine, gives some of the high lights in the development of what has become a large industry:

"Primitive people knew about natural gas, but they were frightened by the weird, ill-smelling 'spirit' that rose from the earth," he writes. "They either worshipped it or let it severely alone. It never occurred to them that they might use it. The oracle at Delphi was built about a natural geyser and was considered a habitation of the gods because persons who communed with the gas spirit became giddy and said queer things. This was attributed to divine inspiration. The site was chosen for a temple and a priestess was appointed to acknowledge the new god properly.

"Today's flourishing industry is a result of an early search for the 'philosopher's stone,' which would turn base metal into gold. In 1609 John van Helmont, a Flemish alchemist, produced 'gas' or 'ghost' as he called it, in his laboratory incident to his experimentation for the rare combination that could make him a Midas and render his touch magic with gold.

Father of Gas Industry

"Nearly 200 years later William Murdock, the 'father of the gas industry,' installed gas lights in his home at Cornwall, England. Soon afterward the world's first gas company was organized by Frederick Winsor, the German chemist who was first to produce gas from wood. The charter was granted by the City of London in 1812. Winsor made such extravagant claims for the future of gas as an industry that he excited great opposition to his scheme and succeeded in making himself the butt of music-hall jibes and an object of ridicule. Sir Walter Scott was very much opposed to Winsor's scheme and wrote to a friend saying:

"'There is a madman proposing to light London with—what do you think? Why, with smoke.'

"The Gas Light Co. of Baltimore, Md. was the first gas company to be formed in the United States. It was organized in 1816. Four years before Newport, R. I., had given gas light a successful year's trial at the instigation of David Melville, who became enthusiastic at England's achievements in the field. Paris was lighted with gas in 1820.

"Our forefathers had some very real objections to the use of gas. Artificial illumination was regarded as an attempt to interfere with the divine plan of the world which had preordained that it should be dark during the night time. Then, too, lighted streets induced people to remain out of doors until late hours, thereby exposing themselves to colds and other ailments. The fear of darkness would vanish with gas light and drunkenness and depravity would increase shamelessly; thieves would be emboldened and horses frightened. Lastly, constant illumination would rob festive occasions of their charm. We can pay tribute to the quaintness and delicacy of our grandsires' sentimentality, but we must admit that these reasons betray a rare lack of practicality.

Big Step Forward

"The industry took a big step forward in 1855 with the revolutionizing inventions of Robert van Bunsen and his eminent pupil, Carl Auer van Welsbach. The Bunsen burner made it possible to burn coal economically with a hot but smokeless flame. Welsbach's gas mantle was not accepted readily at first because of the added cost of the mantle. Its clear, white light soon sold itself, however, and it became an established fixture in the household until the advent of electricity.

"Thaddeus Lowe perfected and patented the manufacture of water gas in 1872. With the exception of a few minor improvements, it is fundamentally the same process that is used today. Engineers called the product 'carburetted water gas' because it was made by passing steam through incandescent hot coke or anthracite and adding oil gas to enrich or carburet the water gas thus produced. It was introduced into England in 1890.

First Gas Holder

"A Frenchman by the name of Lavoisier discovered the principle of the gas holder in 1781. The holder is built like a collapsible drinking cup turned upside down. The lowest section and the overlapping cups are filled with water to insure against leakage. As the gas enters at the bottom, the top lift is pushed upward, and the others follow one after the other.

"In 1859 there were 297 gas plants in the United States, one of which was the Ithaca Gas Light Co. That little company was the forerunner of the present associated system. There are now about 1,000 gas plants in the country, and customers have increased from a few skeptical, curious persons who were willing to 'try anything once' to 52,000,000 users of an indispensable commodity. Over 4,600 cities, towns and villages are served by gas companies.

"At the present time only about 16 per cent of the total gas sold is used for illumination—the only use known a century ago—while 84 per cent is consumed in cooking and heating appliances. Twenty years ago these percentages were just the reverse, and total gas sales were but slightly in excess of present sales for industrial purposes alone."

SLIGHT INCREASE IN CALIFORNIA PRODUCTION

The daily average natural gasoline production in California during March was 241 bbls. greater than in February, according to the latest available report of the Bureau of Mines. One hundred and thirty-six natural gasoline plants with a daily indicated capacity of 1,457,150,000 feet, report a recovery of 41,721,024 gallons of natural-gas gasoline from 27,370,642,000 feet of gas treated in March.

Utilization of natural-gas gasoline amounted to 957,934 bbls., an increase over February of 5,309 bbls. Daily average utilization of 30,901 bbls. was 1,143 bbls. less than daily average production of 32,044 bbls. The following table summarizes the March report:

California Natural Gas-Gasoline Production, Distribution and Stocks—March, 1928

Production

Type of plant—	Gas treated M.C.F.	Nat.-gas gasoline produced (gals.)	Gaso. recovery per MFC gas treated
Oil absorption	17,513,733	26,476,705	1.512
Compressor	253,647	292,975	1.155
Comb. comp. and oil absorption	9,603,262	14,882,514	1.550
Drip	.....	68,830	...
Total	27,370,642	41,721,024	1.524

Finished gasoline produced at plants 20,610 bbls.

Distribution

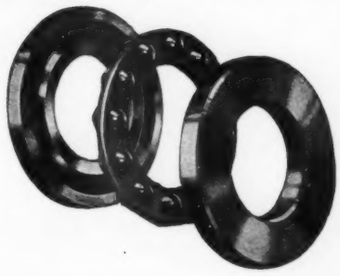
	Bbls.	Bbls.
Stocks first of month		551,096
Prod. during month		993,358
Quan. mixed, with crude or unfinished oils	210,557	
Used in blend, at refineries	612,552	
Stocks end of month	586,520	
Used at plants, shortage and evap. losses	5,238	
Balance	129,587	
	1,544,454	1,544,454

Stocks

	Gals.	Bbls.
Nat.-gas gaso. held by nat.-gas. gaso. plant oprs.	1,393,381	33,176
Nat.-gas gaso. held by refiners	23,240,448	553,344
Total	24,633,829	586,520

	Bbls.
Finished gasoline (motor fuel) held by nat.-gas gasoline plant operators	10

Approved by the Industry



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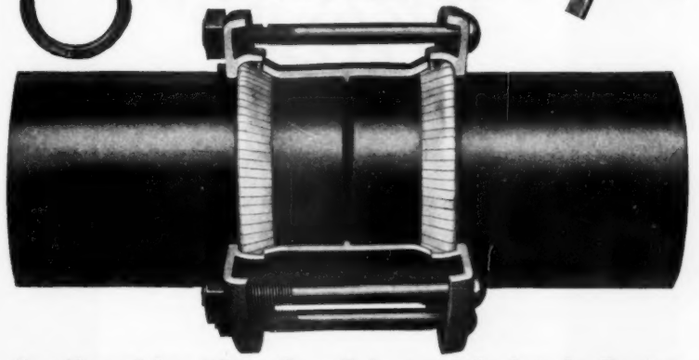

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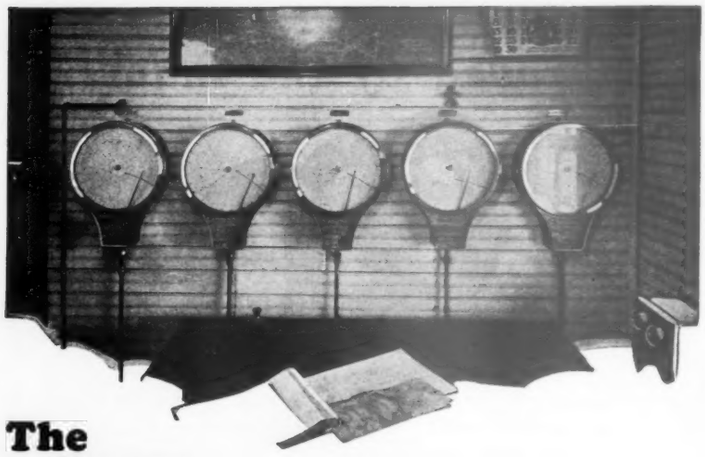

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NEW LOCATIONS IN TEXAS PANHANDLE AND NORTH AND WEST TEXAS FIELDS

Texas Panhandle

Gray County

Parker and others' No. 2 Mrs. M. Parker, 2,310 feet south and 990 feet west of NE cor. of the south 360 acres of E. N. Lynch Survey No. 9. L. R. Travis' No. 1 J. S. Morse, 330 feet south and west of NE cor. of the N half of SW of Section 3, Block 26, H.&G.N. Survey. Travis and others' No. 1 A. Chapman, 330 feet north and east of SW cor. of SW of Section 10, Block 26, H.&G.N. Survey.

Wheeler County

L. W. Rook's No. 2 A. W. Smock, C of SW of SE of Section 5, Block 24, H.&G.N. Survey.

North Central and West Texas

Archer County

C. P. Burton's No. 1 W. F. Parrish, 510 feet north and 1,170 feet east of SW cor. of Section 2, S.P.R.R. Survey, A-1,210. Shasta Oil Co.'s No. 1 L. F. Wilson, 150 feet north and west of SE cor. of SW of NW of Section 1, B.B.B. &C. Survey, A-39. Stidham & Thrasher's No. 1 C. G. Neilson, 150 feet north and east of SW cor. of Section 20, Palo Pinto County School Land, A-339.

Stump & Hines' No. 1 Mrs. A. B. Wallace, 150 feet north and west of SE cor. of Section 11, Denton County School Land, League 3, A-117. Sun Oil Co.'s No. 1 W. L. Andrews, Midway east and west and 150 feet north of south line of Section 140, Robert Carson Survey, A-99. W. C. Young and others' No. 1 W. H. Taylor, 150 feet south and east of NW cor. of N half of NW of SE of Section 1, S.P.R.R. Survey, A-428.

Consolidated Oil Co.'s No. 1 R. C. Kinder, Section 54, 150 feet south and west of NE cor. of Section 54, Block 5, Clark & Plumb Subdivision. Sun Oil Co.'s No. 19 W. R. Farmer, 1,000 feet south and 850 feet west of SW cor. of Richard Chisholm Survey, A-71, and located in the Bell County School Land, A-12.

Brown County

Amerada Petroleum Corp.'s No. 1 J. C. Plumer, 800 feet south and 250 feet west of NE cor. of Section 70, H.T.&B. Survey. Anna Belle Oil Co.'s No. 2 Roy Hickman, 750 feet south and 150 feet west of NE cor. of its lease out of Thomas Benson Survey No. 783. Baker & Hodge's No. 1 J. B. Eubanks, 4,550 feet south and 4,300 feet east of NW cor. of Robert Mitchell Survey No. 141, being 150 feet south and 660 feet west of NE cor. of their 40-acre lease. Blanchard and others' No. 1 J. B. Eubanks, 150 feet north and 1,150 feet east of SW cor. of Robert Mitchell Survey No. 141, being 150 feet north and east of SW cor. of their 20-acre lease.

Bradstreet & Mahlstedt Oil Co.'s No. 1 J. B. Eubanks, 1,148 feet south and 3,460 feet east of NW cor. of Robert Mitchell Survey No. 141. Bradstreet & Stout's No. 11 W. A. Stout, 150 feet south and 450 feet east of NW cor. of their lease out of W. B. Smith Survey No. 155. Conway Brothers' No. 1 J. W. Newton, 150 feet south and west of NE cor. of south 50 acres of west 100 acres of J. W. Newton 472-acre tract out of William Miller Survey No. 149.

Deininger and Empire Gas & Fuel Co.'s No. 1 Mrs. M. A. Culbertson, 150 feet north and west of SE cor. of N half of S. Johnson Survey, A-566, out of Section 4, E.T.R.R. Survey. Gilman & McMurray's No. 3 Roy Hickman-A, 450 feet north and 150 feet east of SW cor. of their lease "A" out of Thomas Benson Survey No. 783. Henshaw Oil Corp.'s No. 12 P. U. Bush, 1,350 feet south and 150 feet west of NE cor. of their 77-acre lease out of James Kinner Survey No. 624. Same corporation's No. 2 J. L. Cross, 4,100 feet south and 1,400 feet east of NW cor. of James Kinney Survey No. 624, being 300 feet south of its No. 1 well. Humble Oil & Refining Co.'s No. 1 R. L. Lewis, 150 feet north and west of SE cor. of the Elisha Mather Survey, A-660. M. L. Richards' No. 7 A. L. Curry, 150 feet south and 750 feet east of NW cor. of E. L. Betts Survey, A-70. H. P. Evans' No. 1 L. Martin, 840 feet north and 150 feet west of SE cor. of W half of NW of Section 10, H.T.&B. Survey.

Callahan County

Beams & Kingwood's No. 2 I. N. Jackson-A, 330 feet south and west of NE cor. of NW of NW of Section 115, B.B.B.&C. Survey.

Coleman County

Roth & Faurot's No. 1 J. T. Nixon, 150 feet south and west of NE cor. of Lot No. 50, Burnet County School Land No. 703. Roth & Faurot's No. 3 J. E. and T. L. Stevens, 100 feet north of south line of Lot No. 5, Coleman County School Land No. 57, and 200 feet northeast of P. & N. T. right of way. Williams Petroleum Co.'s No. 1 L. S. West, 2,333 feet south and 1,680 feet east of most northerly NW cor. of O. N. Vaughn Survey. Barbee & Ross' No. 1 H. M. Weir, 1,700 feet south and 1,000 feet east of NW cor. of M. Lappe Survey No. 744, A-475.

Continental Oil Co. and others' No. 1 Sealy and Smith, 3,300 feet south and 254 feet west of NE cor. Section 13, Block 1, G.H.&H. Survey. E. J. Cunningham's No. 2 G. W. and L. W. Jennings, 150 feet north and west of SE cor. of north 50 acres of west 95 acres of east 331 acres of A. S. Lipscomb Survey No. 94. Red Bank Oil Co.'s No. 1 J. E. May, 1,100 feet south and 1,325 feet west of NE cor. of SE of Section 27, Block 1, G.H. &H. Survey.

Cooke County

M. B. Flesher and others' No. 1 Josie Jones, 200 feet north and 1,757 feet east of SW cor. of George D. Hill Survey, A-462. Oil Operators Trust Co.'s No. 1 M. J. Kleiss-A, 972 feet north and 970 feet west of SE cor. of M. J. Kleiss 117-acre tract out of J. W Littleton Survey, A-586. W. F. Russell's No. 1 J. F. Marshall estate, 8,153 feet north and 2,221 feet west of SE cor. of Aaron Burnes Survey, A-49. Simms Oil Co.'s No. 1 B. F. Mitchell, 3,605 feet south and 1,756 feet east of NW cor. of B.B. B.&C. Survey No. 15, A-147.

Crane County

Gulf Production Co.'s No. 51 J. T. McElroy, 1,442 feet south and 1,650 feet west of NE cor. of their lease out of Section 201, Block F, C.C.S.D.&R.G.N.G. R.R. Survey.

Crockett County

Gulf Production Co.'s No. 1 G. L. Thompson-A, 200 feet south and 4,661 feet east of NW cor. of Section 74, Block 1, I.&G.N. Survey. Republic Production Co.'s No. 1 L. P. Powell-B, 330 feet south and 1,320 feet west of NE cor. of Section 52, Block BB, G.C.&S.F. Survey. Transcontinental Oil Co.'s No. 1 J. D. Atwood estate, 250 feet south and east of NW cor. of Section 7, Block PP, T.C.R.R. Survey.

Denton County

Canadian Oil & Gas Co.'s No. 1 P. A. Coppage, 450 feet north and 750 feet west of SE cor. of M. T. Bates Survey.

Eastland County

J. W. Amyx and others' No. 5 C. U. Connellee, 1,450 feet north and 2,000 feet east of SW cor. of N. Ussury Survey, being 200 feet north and 750 feet west of SE cor. of their 80-acre lease. L. Teatsorth and others' No. 2 O. Holcomb and others, 750 feet south and 150 feet east of NW cor. of SW of Section 1, Block 4, H.&T.C. Survey.

Howard County

Godley Oil Co.'s No. 4 A. J. Hooks, 1,520 feet south and 590 feet east of NW cor. of Section 140, Block 29, W. &N.W. Survey.

Jack County

Amerada Petroleum Corp.'s No. 1 Mrs. E. J. Crawford and others, 3,560 feet northeast of southwest line and 250 feet southeast of northwest line of the William McDonald Survey, A-380. Same corporation's No. 2 Mrs. E. J. Crawford

and others, 4,300 feet northeast of southwest line and 4,650 feet southeast of northwest line of the William McDonald Survey, A-380. Same corporation's No. 3 Mrs. E. J. Crawford and others, 2,700 feet southeast of northwest line and 1,700 feet northeast of southwest line of the William McDonald Survey, A-380.

Amerada Petroleum Corp.'s No. 4 Mrs. E. J. Crawford and others, 1,700 feet southwest of southwest line of G. Tinsley Survey, A-2,430, and 150 feet southeast of southeast line of M. Anderson Survey, A-5, and located in the William McDonald Survey, A-380.

Kent County

J. S. Cosden & Co.. Inc.'s No. 1 N.V. Bilby, 1,320 feet north and east of SW cor. of Section 56, Block 98, H.&T.C. Survey.

Menard County

Panhandle Refining Co.'s No. 1 G. P. Eckardt, C of SW of Section 10, Block 2, T.W.N.G.R.R. Survey.

Montague County

Arco Oil Co.'s No. 5 Mrs. S. F. Loy and others, 1,422 feet north and 209 feet west of SE cor. of their 49.5-acre lease out of Lot No. 4, J. W. Jones Subdivision, William Donoho Survey, A-178. Bridwell Oil Co. and Continental Oil Co.'s No. 1 Mrs. L. Cunningham-A, 4,811 feet north and 150 feet west of SE cor. of T. R. Edmondson Survey, A-222.

Pecos County

Mid-Kansas Oil & Gas Co.'s No. 2 I. G. Yates, 1,407 feet south and 872 feet east of NE cor. of Section 104, Block 194, G.C.&S.F. Survey, and located in Section 34½.

Runnels County

Gibson & Johnson's No. 1 W. H. Rainwater, 660 feet north and east of the most southerly SW cor. of J. H. San Miguel Survey, being in the center of the south 40 acres of the west 60 acres of W. H. Rainwater 250-acre tract.

Shackelford County

Roeser & Pendleton's No. 2 W. I. Cook-A, Section 61, 150 feet south and east of NW cor. of SE of SW of Section 61, Block 10, E.T.R.R. Survey. Same company's No. 3 W. I. Cook-A, Section 62, 1,440 feet south and 160 feet east of NW cor. of Section 62, Block 10. E.T. R.R. Survey. Skelly Oil Co.'s No. 3 J. B. Matthews-N, 150 feet north and west of SE cor. of W half of NE of Section 33, Block 10, E.T.R.R. Survey. Same company's No. 4 J. B. Matthews-N, 450 feet south and 150 feet west of NE cor. of W half of SE of Section 33, Block 10, E.T.R.R. Survey. Tannehill Oil Co.'s No. 3 J. B. Matthews, Section 33, 150 feet north and 450 feet east of SW cor. of E half of NE of Section 33, Block 10, E.T.R.R. Survey. Wentz Oil Corp.'s No. 9 R. J. Moberley, 150 feet north and 737 feet west of SE cor. of SW of Section 13, Block 11, T. &P.R.R. Survey.

Wichita County

Magnolia Petroleum Co.'s No. 139 Hugh Reilly, 3,100 feet south and 200 feet east of the most northerly northwest corner of L. C. Denison Survey, A-55. H. D. White and others' No. 3 J. W. Donohoe, 150 feet south and 100 feet west of NE cor. of J. W. Robertson Survey, A-252. Coleman & Coppock's No. 8 Kemp & Kempner, 1,376 feet south and 1,060 feet west of NE cor. of Block 82, Kemp Wichita Valley Land. Coleman & Coppock and others' No. 1 J. A Watkins, 100 feet north and east of SW cor. of north 40 acres of south 140 acres of Block 46,Kemp Wichita Valley Land. W. H. Hammon and others' No. 8 S. H. McCarty-C, 150 feet south and 450 feet west of NE cor. of their "C" lease out of W. R. Eaves Survey, A-447.

Holbrook & Wood's No. 18 Kemp & Kempner, 1,350 feet north and 1,020 feet west of SE cor. of Block 82, Kemp Wichita Valley Land. T. F. Hunter's No. 31 J. L. and T. J. Waggoner, 1,150 feet south and 1,050 feet east of NW cor. of Section 8, G.H.&H., A-748. Same company's No. 32 J. L. and T. J. Waggoner, 1,450 feet south and 1,050 feet east of NW cor. of Section 8, G.H.&H. Survey, A-748. T. F. Hunters No. 33 J. L. and T. J. Waggoner, 977 feet south and 1,506 feet west of NE cor. of Section 1, G.C.&S.F. Survey, A-528.

Rio Bravo Oil Co.'s No. 2 Rio Bravo Oil Co.-C, 1,450 feet south and west of NE cor. of E half of NW of Section 31, Block 5, H.&T.C. Survey. Same company's No. 4 Rio Bravo Oil Co.-C, 1,500 feet south and 1,450 feet west of same corner of same lease. Same company's No. C-12 Rio Bravo Oil Co.-C, 100 feet south and 600 feet west of same corner of same lease. Same company's No. C-13 Rio Bravo Oil Co.-C, 725 feet south and 525 feet west of same corner of same lease. Same company's No. C-14 Rio Bravo Oil Co.-C, 1,225 feet south and 600 feet west of same corned of same lease. Same company's No. C-4-D, Rio Bravo Oil Co.-C, 900 feet north and 250 feet west of SE cor. of E half of NW of Section 31, Block 5, H.&T.C. Survey. Same company's No. C-1-G, Bio Bravo Oil Co.-C, 250 feet south and west of NE cor. of E half of NW of Section 31, Block 5, H.&T.C. Survey. Same company's No. C-1-K Rio Bravo Oil Co.-C, 200 feet south and 250 feet west of same corner of same lease.

Rubsam & Hunter's No. 4 W. D. McClure, 1,017 feet north and 1,850 feet east of most southerly SW cor. of Section 5, G.C.&S.F. Survey, A-363. Same company's No. 5 W. D. McClure, 700 feet north and 2,600 feet west of SE cor. of Section 5. G.C.&S.F. Survey, A-363, being 1,068 feet south and 989 feet east of NW cor. of their 85.5-acre lease. Same company's No. 6 W. D. McClure, 1,068 feet south and 1.289 feet east of NW cor. of their 85.5-acre lease out of Section 5, G.C.&S.F. Survey, A-363.

Rubsam & Hunter's No. 7 W. D. McClure, 468 feet south and 1,350 feet east of NW cor. of their 85.5-acre lease out of Section 5, G.C.&S.F. Survey, A-363. Same company's No. 8 W. D. McClure, 468 feet south and 1,050 feet east of same corner of same lease. Same company's No. 9 W. D. McClure, 768 feet south and 1,039 feet east of same corner of same lease. Same company's No. 10 W. D. McClure, 718 feet south and 1,289 feet east of same corner of same lease. Same company's No. 11 W. D. McClure, 468 feet south and 750 feet east of same corner of same lease. Same company's No. 12 W. D. McClure, 668 feet south and 1,289 feet east of same corner of same lease. Same company's No. 13 W. D. McClure, 468 feet south and 450 feet east of same corner of same lease. Same company's No. 14 W. D. McClure, 468 feet south and 150 feet east of same corner of same lease. Same company's No. 15 W. D. McClure, 468 feet south and 1,650 feet east of same corner of same lease. Same company's No. 16 W. D. McClure, 150 feet south and east of same corner of same lease.

Rubsam & Hunter and others' No. 1 W. D. McClure, 665 feet north and 425 feet west of SE cor. of W. D. McClure 227-acre tract out of Section 5, G.C.&S.F. Survey, A-363. Shappell Oil Co.'s No. 1 G. W. Lewis, 150 feet north and 170 feet west of SE cor. of Block 20, Kemp Wichita Valley Land.

Wilbarger County

Empire Gas & Fuel Co.'s No. 1 W. T. Waggoner-B, 1,170 feet north and 1,810 feet west of SE cor. of east 240 acres of north 320 acres of Section 41, M.E. P.&P. Survey. Fain-McGaha Oil Corp.'s No. 5 W. T. Waggoner-L, 1,350 feet south and 150 feet east of NW cor. of their "L" lease out of Section 31, Block 4, H.&T.C. Survey. Same corporation's No. 6 W. T. Waggoner-M, 150 feet south and west of NE cor. of SW of SW of Section 24, Block 4, H.&T.C. Survey. Same corporation's No. 7 W. T. Waggoner-M, 150 feet south and 450 feet east of NW cor. of SW of SW of Section 24, Block 4, H.&T.C. Survey.

Golding-Cochran and others' No. 1 W. T. Waggoner-G, 150 feet south and east of NW cor. of NE of SE of Section 24, Block 4, H.&T.C. Survey. Golding-Cochran and others' No. 1 W. T. Waggoner-H, 150 feet north and west of SE cor. of north 50 acres of south 100 acres of west 213 acres of Section 33, Block 4, T.&T.C. Survey. Phillips Petroleum Co.'s No. 2 W. T. Waggoner-Brady, 200

C. A. DALLY, JR.
Manager

T. J. HEARD
Sec'y-Treas.

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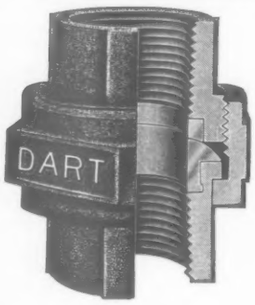

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feet south and 150 feet east of NW cor. of NW of SE of Section 30, Block 4, H.&T.C. Survey. The Texas Company's No. 6 W. T. Waggoner-C, 205 feet north and east of SW cor. of NE of SE of Section 25, Block 4, H.&T.C. Survey. Same company's No. 2 W. T. Waggoner-D, 2,435 feet south and 1,526 feet west of NE cor. of Section 43, M.E.P.&P. Survey.

Winkler County

Atlantic Oil Producing Co.'s No. 5 Grisham-Hunter-E, 330 feet south and west of NE cor. of Section 41, Block B-5, School Land Gulf Production Co.'s No. 18 T G. Hendrick, Tract-B, 440 feet south and 330 feet west of NE cor. of NE of Section 45, Block 26, School Land. Same company's No. 19 T. G. Hendrick, Tract-B, 440 feet south and 330 feet east of NW cor. of NE of Section 45, Block 26, School Land. Humble Oil & Refining Co.'s No. 1 T. G. Hendrick-B, 2,200 feet north and 1,650 feet east of SW cor. of Section 39, Block 26, School Land. Same company's No. 5 T. G. Hendrick-C, 2,310 feet north and 330 feet west of SE cor. of Section 32, Block 26, School Land. Same company's No 6 T. G. Hendrick-C, 330 feet south and west of NE cor. of Section 32, Block 26, School Land.

Landreth Production Corp. and others' No. 1 T. G. Hendrick-E, 2,200 feet south and 990 feet east of NW cor. of Section 39, Block 26, School Land. Skelly Oil Co.'s No. 7 T. G. Hendrick-B, 2,200 feet south and 1,650 feet east of NW cor. of Section 39, Block 26, School Land. Skelly Oil Co.'s No. 2 T. G. Hendrick, 440 feet south and 330 feet west of NE cor. of west half of east half of Section 40, Block 26, School Land. Same company's No. 3 T. G. Hendrick, 2,200 feet south and 1,650 feet west of NE cor. of Section 40, Block 26, School Land. Same company's No. 4 T. G. Hendrick, 2,200 feet north and 1,650 feet west of SE cor. of Section 40, Block 26, School Land. Same company's No. 5 T. G. Hendrick, 440 feet north and 330 feet east of SW cor. of west half of east half of Section 40, Block 26, School Land.

Southern Crude Oil Purchasing Co.'s No. 1 Ida Hendrick, Tract-264, 1,650 feet north and 330 feet west of SE cor. of Section 5, Block B-12, School Land. Winkler Oil Producing Corp.'s No. 1 T. G. Hendrick, 330 feet south and east of NW cor. of Section 33, Block 26, School Land.

Young County

Allen & McKee's No. 1 J. W. Hickerson, 150 feet south and east of NW cor. of Section 1,951, T.E.&L. Survey. Bullington-Lee & Pendleton's No. 2 J. L. Boone, 450 feet south and 150 feet east of NW cor. of NE of NW of Section 1, B.B.B.&C. Survey, A-34. J. C. Cunningham's No. 6 B. Hawkins, 150 feet south and 1,170 feet west of NE cor. of Section 1,914, T.E.&L. Same company's No. 7 B. Hawkins, 450 feet south and 1,170 feet west of NE cor. of Section 1,914, T.E.&L. Survey.

J. C. Cunningham and others' No. 1 R. A. Dunan, 150 feet north and west of SE cor. of Section 1,998, T.E.&L Survey. C. W. Forbess and others' No. 1 G. T. Washburn, 450 feet south and 1,650 feet east of NW cor. of NE of Section 3, G.B.&N. Co., Survey A-1,714. N. B. Goldsmith's No. 1 R. A. Petty and H P. Miller, 150 feet south and east of NW cor. of east 50 acres of south 100 acres of east 262 acres of Section 3,404, T.E. &L. Survey.

C. Kleiner and others' No. 7 C. W. Langston, 150 feet north and 450 feet west of SE cor. of Section 1,490, T.E. &L. Survey. Madden & Hunt's No. 1 J. Kilcrease, 150 feet south and east of NW cor. of east 40 acres of south half of Section 1,809, T.E.&L. Survey. H. L. Parker and others' No. 2 C. W. Johnson, 150 feet south and 750 feet west of NE cor. of Lot No. 4, Ed W. Sergeant Survey, A-253. E. F. Scott and others' No. 1 J. M. Kirby, 750 feet south and 1,542 feet west of NE cor. of north 173.1-acre tract out of Section 1,934, T.E.&L. Survey.

Shappell Oil Co.'s No. 1 J. R. Cox and others, 150 feet north and 53 feet west of NE cor. of J. O. and L. Stratton

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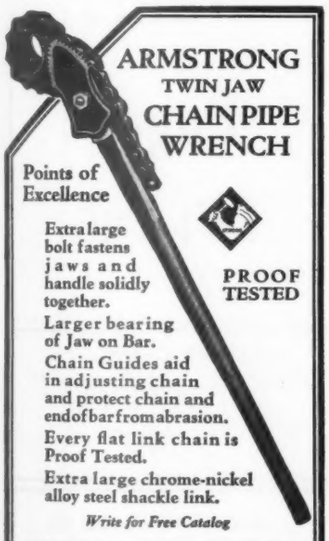

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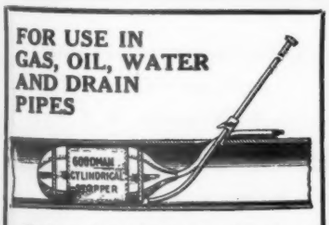

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100-acre tract out of S. Sallie Survey, A-252, and located on J. R. Cox and others' 354.5-acre tract. Same company's No. 10 C. W. Langston, 450 feet north and 750 feet east of SW cor. of Ed W. Sergeant Survey, A-253. W. R. Stafford's No. 1 C. W. Langston, 1,170 feet south and 450 feet west of NE cor. of Section 1,490, T.E.&L. Survey. Same company's No. 2 C. W. Langston, 1,170 feet south and 1,470 feet west of NE cor. of Section 1,490, T.E.&L. Survey. Pitzer & West's No. 4 Costello Brothers, 1,550 feet northwest of southeast line and 77 feet southwest of southwest line of Lot No. 5, J. M. Johnson Survey, A-161.

Corrected Locations

Brown County: Gilman & McMurray's No 2 Roy Hickman, 2,175 feet south and 3,250 feet west of NE cor. of Thomas Benson Survey, No. 783, being 180 feet north and 160 feet east of SW cor. of their lease. Same company's No. 1 Roy Hickman-A, 2,205 feet south and 3,600 feet west of NE cor. of Thomas Benson Survey No. 783, being 150 feet north and 140 feet west of SE cor. of their 26.61-acre "A" lease. Cox & Drake's No. 1 Mrs. M. A. Culberson, 150 feet south and 750 feet west of NE cor. of Jesse Cason Survey, A-1,393.

Coleman County: E. J. Cunningham's No. 1 G. W and L. P. Jennings, 1,300 feet south and 2,100 feet west of NE cor. of A. S. Lipscomb Survey No. 94. E. J. Cunningham and others' No. 1 G. W. Rise, midway north and south and 150 feet west of east line of west 95 acres of east 426.37 acres of the A. S. Lipscomb Survey No. 94.

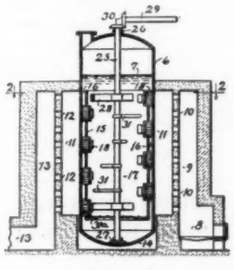
Ward County: Estex Oil Co.'s No. 1 W. A Estes, C of SW of NE of Section 4, Block B-29, School Land.

Winkler County: Pure Oil Co 's No. 3 Grisham-Hunter-C, 330 feet north and west of SE cor. of Section 45, Block 26, School Land. Roxana Petroleum Corp.'s No. 2 Grisham-Hunter-F, 330 feet north and east of SW cor. of Section 46, Block 26, School Land.

Young County: E. R. Riggs and others' No. 4 J. B. McKinley, 450 feet south and 150 feet east of NW cor. of west 200 acres of Section 1,489, T.E.& L. Survey.

Recent Patents

1,664,263. Cracking Oils. Franz Puening, Pittsburgh, Pa. Filed May 26, 1919. Serial No. 299,973. Sixteen claims. (Cl. 196—68.)



1. The method of cracking oil, which consists in subjecting an annular column of oil to a cracking heat, while effecting a rapid movement of the oil by thermosiphonic action, and concurrently mechanically removing the carbon from the heated portions of the walls surrounding the column of oil.

9. An oil cracking apparatus comprising a heating chamber adapted to produce a heated zone; a substantially vertical boiler disposed therein and having its extremities extended beyond the heated zone, a substantially vertical shell for the passage of the oil located within the boiler and having a passageway therethrough opening at its ends into said boiler, the space between the boiler and shell being of substantially uniform cross-sectional area in different horizontal planes whereby the speed of the oil is substantially uniform at all points in said space, mechanical scraper elements carried by the outer wall of said shell and

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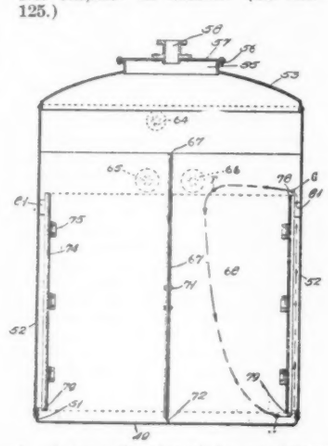
adapted to operate on the inner wall surface of the boiler, and means for effecting concurrent rotation of said shell and mechanical scrapers.

1,664,863. Still. Franz Puening, Pittsburgh, Pa., assignor to The Koppers Co., Pittsburgh, Pa., a corporation of Delaware. Filed July 25, 1924. Serial No. 728,250. 20 Claims. (Cl. 196—125.)



1. A tar still adapted for continuous operation comprising, in combination: a cylindrical plate providing a vertical heating wall and a space; a bottom and cover therefor; material inlet and outlet openings therefor; partitions arranged within said plate to provide compartments, one of said partitions extending diametrically across the space provided by said plate, and the other of said partitions extending from said plate to said diametrically extending partition, the upper ends of said partitions terminating a short distance above the inlet and outlet openings; vertically extending baffles arranged between each two partitions and alongside of but spaced from said plate, the lower edges of said baffles being spaced from said bottom, and the upper edges stopping below the outlet opening level, each of said baffles being hingedly secured to its partition; said partitions having apertures therein near their upper edges and below the outlet opening level and between the baffles and the heating plate to permit passage of the material being treated from one compartment to the next.

16. A still having a cylindrical upwardly extending heating wall, a top and a bottom adjacent thereto, an inlet and an outlet therefor, partitions therein subdividing said still into compartments; baffles arranged concentric to but spaced from said heating wall, said baffles being rigidly secured to said partitions, said baffles being spaced from said bottom and terminating at their upper ends below the outlet for the material to be treated.

GOOD SHOWING OF OIL FOUND NEAR HAVANA

HOUSTON, Tex., May 5.—The next great petroleum field of the world may be found in Cuba near the city of Havana, according to Frederick Todd, United States commercial attache to that city.

Near Havana is a well which flows pure naphtha which is of a higher specific gravity test than gasoline, he says. Much asphalt is secured from the region east of Havana between that city and Matanzas, another good indication that pools of petroleum are waiting underneath the surface for development, he said.

Within recent months there has been considerable exploration work and surveys made by scouts for American, British and other oil concerns.

"The prospects for oil in Cuba look very promising, business men think," Mr. Todd said, "and it may be that the district around Havana some day will be the Tampico of Cuba. There is much talk of oil in Cuba, but as yet little activity."

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Accuracy and Promptness

It is unnecessary to add anything to this extract from a letter from J. T. Huggard of Winnipeg, Manitoba, just received by The Oil and Gas Journal:

"The accuracy and promptness with which you furnish information is simply invaluable. A friend of mine invested in some oil lands in the United States, they were boring for oil; he was rather anxious to know what the result was. It was arranged that he could get direct information from the parties from whom he bought the interests. I lent him a copy of my Journal with the result that he got the information some days ahead of getting it from his own private correspondents. It gave both dates, item, name and position with the utmost accuracy; this has occurred in several instances to my own personal knowledge. Your Journal is simply invaluable to anyone who takes an interest in oil matters."

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Oklahoma-Kansas and Eastern Pipe Line Report

OKLAHOMA-KANSAS
Pipe Line Statement for March

Runs

Company—	Month Bbls.	Dly. Av. Bbls.
Prairie P. L. Co.*	4,371,000	141,000
Gulf P. L. Co.	1,306,253	42,137
Texas P. L. Co.	1,142,479	36,854
Magnolia Pet. Co.	2,205,763	71,154
Empire P. L. Co.	811,148	26,166
Cosden P. L. Co.	888,890	28,674
Sinclair P. L. Co.	2,673,750	86,250
Oklahoma P. L. Co.	3,029,429	97,724
Other lines	7,099,000	229,000
Total March	23,527,712	758,959
Total February	22,554,253	777,733
Difference	973,459	18,974

Shipments

Prairie P. L. Co.†	5,253,096	169,455
Gulf P. L. Co.	1,321,952	42,644
Texas P. L. Co.	1,171,394	37,787
Magnolia Pet. Co.	1,873,776	60,440
Empire P. L. Co.	821,540	26,501
Cosden P. L. Co.	941,397	30,368
Sinclair P. L. Co.†	2,885,727	93,088
Oklahoma P. L. Co.	2,875,574	92,760
Other lines	7,688,000	248,000
Total March	24,832,456	801,043
Total February	23,542,339	811,003
Difference	1,290,117	9,960

Stocks

	Bbls.
Prairie O. & G. Co.	33,520,000
Prairie P. L. Co.	2,500,000
Gulf P. L. and Gypsy Oil Cos.	10,205,075
The Texas Company	6,752,953
Magnolia Pet. Co.	7,973,596
Empire P. L. Co.	4,251,758
Mid-Continent Pet. Corp.	3,556,338
Sinclair Crude Oil Pur. Co.	19,950,000
Carter Oil Co.	14,278,140
Oklahoma P. L. Co.	3,203,326
Other lines	11,900,000
Total March	118,091,186
Total February	117,934,469
Difference	156,717

*Estimated. †Prairie P. L. shipments include Texas crude oil and Sinclair shipments include Texas and Wyoming crude oil.

NOTE—Stocks do not include approximately 8,000,000 bbls. of crude oil held in storage on private tank farms and leases and approximately 1,400,000 bbls. of Texas Panhandle crude oil in storage in Oklahoma.

EASTERN PIPE LINE REPORT
Runs From Wells

In the following table will be found the regular receipts from wells by various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for February and March:

	Feb., '28	Mar., '28
Nat. Transit	150,792.56	170,381.24
S. W. P. P. L.	86,300.70	96,738.67
Eureka P. L.	358,514.02	395,925.46
Buckeye P. L. (Macksburg)	336,290.24	363,109.67
Buckeye P. L. (Cleve.)	10,650.78	11,122.25
Buckeye P. L. (Lima, etc.)	108,503.36	120,274.94
Indiana P. L.	6,990.90	6,526.96
Cumberland P. L.	216,913.65	231,081.93
N. Y. Transit	20,961.60	24,499.36
Tidewater P. L.	179,353.35	181,399.11
Pure Oil	64,170.62	67,517.94
Emery P. L.	54,952.72	57,577.93
Paragon Dev.	46,564.77	55,979.26
Stoll Oil Ref.	12,100.29	.....
Total	1,653,059.46	1,782,134.72
Daily average	57,002.05	57,488.22

Note—Indian Refining Co. also reported other receipts of 347,281.21 bbls. Paragon Refining Co. had other receipts of 197,794.28 bbls. Paragon Development had other receipts of 2,317.25 bbls.

Petroleum Deliveries

The following tables exhibit the shipments or regular deliveries of various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for February and March.

	Feb., '28	Mar., '28
Nat. Transit	550,710.53	548,681.98
S. W. Pa. P. L.	300,851.13	438,196.09
Eureka P. L.	92,771.88	205,994.31
Buckeye P. L. (Macksburg)	134,030.96	168,473.81
Buckeye P. L. (Cleve.)	978.44	976.93
Buckeye P. L. (Lima, etc.)	1,301,510.04	960,869.54
Indiana P. L.	1,160,002.87	1,240,186.42
Cumberland P. L.	127,571.67	144,935.24
N. Y. Transit	149,006.60	145,403.04
Northern P. L.	163,752.84	176,203.73
Tidewater P. L.	143,951.23	194,170.85
Pure Oil	63,494.40	69,545.77
Emery P. L.	54,814.47	54,304.29
Paragon Ref.	167,179.39	193,052.03
Indian Ref.	307,199.80	358,460.97
Paragon Dev.	45,839.18	57,926.14
Total	4,853,665.43	4,956,385.14
Daily average	167,367.77	159,883.39

Gross Stocks

The gross stocks held by various pipe lines in the oil-producing sections of New York, Pennsylvania, West Virginia, Ohio, Indiana and Kentucky at the close of February and March:

	Feb., '28	Mar., '28
Nat. Transit	1,123,231.06	1,156,703.69
S. W. Pa. P. L.	756,131.52	656,661.49
Eukera P. L.	1,782,756.00	1,590,080.78
Buckeye P. L. (Macksburg)	424,216.38	413,024.91
Buckeye P. L. (Cleveland)	55,006.63	44,540.16
Buckeye P. L. (Lima, etc.)	4,763,213.91	4,776,825.13
Indiana P. L.	695,467.72	778,310.93
Cumberland P. L.	650,094.40	668,275.42
Southern P. L.	383,995.42	502,604.64
N. Y. Transit	808,998.76	921,342.77
Northern P. L.	537,565.25	531,081.55
Pure Oil	60,318.70	59,986.11
Emery P. L.	7,916.48	12,409.42
Paragon Refining	20,811.72	25,285.68
Indian Refining	10,031.11	11,874.10
Paragon Devel.	100,463.76	90,719.69
Total	12,180,418.82	12,239,725.47
Increase	96,290.94	59,306.65

Grades of Oil

The following table shows the amount of the different grades of oil held by the Eastern Pipe Lines at the close of February and March, showing the gross stocks of the above fields:

	Feb., '28	Mar., '28
Pennsylvania	3,821,514.45	3,755,332.90
Lima	762,432.37	836,291.60
Kentucky	1,049,761.11	1,059,426.47
Mid-Continent	6,460,176.14	6,539,436.81
Illinois	86,534.75	49,237.69
Total	12,180,418.82	12,239,725.47

Daily Average Runs

The following table shows the daily average runs of the Pennsylvania, Lima and Kentucky oil fields for the past four years:

	1925	1926	1927	1928
January	56,831	55,630	56,209	52,904
February	60,606	60,394	61,298	57,002
March	60,575	61,644	63,247	57,485
April	63,062	63,019	60,337	.....
May	59,217	60,580	60,284	.....
June	61,270	61,131	62,757	.....
July	62,639	63,206	58,674	.....
August	69,686	61,815	60,870	.....
September	62,516	64,639	61,285	.....
October	145,388	161,132	147,036	.....
November	59,350	61,774	57,275	.....
December	57,974	58,755	53,089	.....

Daily Average Shipments

The following table gives daily average shipments from the Pennsylvania, Lima and other fields for the past four years:

	1925	1926	1927	1928
January	157,889	156,056	141,227	146,465
February	160,863	159,488	138,534	167,368
March	154,591	150,239	133,777	159,883
April	151,429	152,371	140,227	.....
May	146,995	160,998	144,594	.....
June	149,467	160,257	149,772	.....
July	161,338	160,045	151,850	.....
August	161,730	151,929	188,653	.....
September	156,719	158,915	144,213	.....
October	145,388	161,132	147,036	.....
November	143,582	152,608	150,975	.....
December	150,162	136,428	144,504	.....

Gross Stocks

In the following table will be found the gross stocks of the various lines of the Pennsylvania, Lima and Kentucky oil fields, including oil received from other lines at the close of each month for the past three years:

	1926	1927	1928
January	9,859,170	9,718,008	12,276,718
February	9,579,354	10,119,162	12,180,413
March	9,438,292	10,794,044	12,239,725
April	9,805,851	11,112,295	.....
May	9,531,757	11,359,381	.....
June	9,585,904	11,493,673	.....
July	9,734,687	11,458,128	.....
August	9,058,947	11,989,115	.....
September	9,436,732	12,212,716	.....
October	9,269,806	12,047,661	.....
November	9,257,067	11,939,740	.....
December	9,454,512	12,340,297	.....

Franklin Pipe Line Co.

The following table exhibits the condition of the Franklin Pipe Line at the close of business for the months named and not counted in the stocks and averages reported above:

	1926—Runs	—Shipments	—Stocks.
1927—			
March	2,587.20	1,878.66	16,664.96
April	2,834.23	1,512.65	17,986.54
May	2,708.40	539.29	20,215.73
June	2,946.28	664.40	22,497.61
July	3,153.39	1,276.61	24,374.39
August	3,057.89	8,713.11	18,719.17
September	3,309.56	2,656.48	19,372.25
October	2,801.32	1,226.99	20,946.58
November	2,746.50	2,220.53	21,472.56
December	2,779.86	1,893.69	22,358.73
1928—			
January	1,886.06	2,424.79	21,819.99
February	2,460.14	3,109.34	21,170.79
March	2,578.86	3,540.33	20,209.32

The Illinois Field

The following table gives the report of the Illinois Pipe Line Co. in Illinois:

Gross stock, April 1	2,260,406.44
Runs from wells	656,684.41
Other receipts	488,152.56
Regular deliveries	465,052.26
Other deliveries	654,958.95

The amount of Illinois oil run by the Tidewater Pipe Co. in March was 68,566.41 bbls., and deliveries were 55,542.43 bbls. Adding these figures to those of the Illinois Pipe Line Co. makes the runs and deliveries as follows:

1927—	Runs	Deliveries
March	727,593.94	554,947.42
April	598,225.97	444,818.49
May	728,759.40	543,192.02
June	640,975.85	532,217.78
July	613,961.30	484,902.53
August	651,276.40	529,331.37
September	619,589.49	433,212.49
October	601,099.25	408,287.58
November	605,621.14	415,185.06
December	577,321.25	397,176.07
1928—		
January	561,759.57	434,147.02
February	573,619.78	450,217.81
March	725,250.82	520,595.69

Tidewater Pipe Co., Ltd., also delivered in March, 232,980.34 bbls. of Oklahoma oil.

AVERAGE DAILY RECEIPTS OF CALIFORNIA OIL AT ATLANTIC AND GULF COAST PORTS

Average bbls. per day—	ATLANTIC PORTS Baltimore	Boston	New York	Philadelphia	Others	Total	GULF COAST PORTS Galveston	New Orleans Baton Rouge	Port Arthur Sabine Pass	Tampa	Total	Total All Ports
November	9,433	2,833	23,033	15,166	4,833	55,400	.....	.....	.....	.....	.....	55,400
December	10,742	3,033	30,258	24,387	7,065	75,484	.....	.....	.....	.....	3,613	79,097
January	16,387	3,033	31,032	7,452	9,710	66,613	.....	.....	.....	.....	.....	66,613
February	3,588	.....	31,980	19,734	10,230	65,532	.....	.....	.....	.....	.....	65,532
March	8,065	2,258	11,807	10,065	5,258	37,452	.....	.....	.....	.....	.....	37,452

AVERAGE DAILY IMPORTS OF PETROLEUM AT PRINCIPAL UNITED STATES PORTS

Average bbls. per day—	ATLANTIC PORTS Baltimore	Boston	New York	Philadelphia	Others	Total	GULF COAST PORTS Galveston	New Orleans Baton Rouge	Port Arthur Sabine Pass	Tampa	Total	Total All Ports
November	35,233	8,033	84,533	30,100	27,067	184,967	4,000	26,500	2,000	1,667	34,167	219,133
December	39,968	2,387	78,968	19,097	29,836	170,255	2,580	15,356	839	1,226	20,000	190,255
January	15,226	4,323	107,445	27,871	39,774	194,829	6,000	32,516	..	1,355	39,871	233,700
February	6,796	1,175	108,295	26,533	9,807	178,536	7,891	32,114	6,555	2,829	39,829	217,865
March	22,839	3,963	112,323	45,516	28,516	218,161	7,419	13,291	6,645	1,903	29,258	247,419

GROSS PRODUCTION IN UNITED STATES FOR 12 MONTHS (REVISED)
(In Barrels)

		California	Oklahoma	Texas	Kansas	Arkansas	Louisiana	Rocky Mountains	Eastern Fields	Total
1927—										
April:	Month	19,493,825	22,208,130	17,755,920	3,516,930	3,378,240	2,039,550	2,671,830	3,474,000	76,538,425
	Daily average	649,794	740,271	591,864	117,231	112,608	67,985	89,061	115,800	2,484,614
May:	Month	19,506,054	23,258,463	19,489,607	3,704,314	3,493,669	1,984,651	2,682,151	3,467,000	77,586,909
	Daily average	629,228	750,273	628,697	119,494	112,699	64,021	86,521	111,839	2,502,771
June:	Month	19,181,442	22,830,330	18,360,450	3,437,580	3,365,760	1,920,180	2,634,570	3,330,000	75,060,312
	Daily average	639,381	761,011	612,015	114,586	112,192	64,006	87,819	111,000	2,621,189
July:	Month	19,319,021	26,522,546	17,580,348	3,454,082	3,406,683	2,311,019	2,678,679	3,363,300	78,635,678
	Daily average	623,194	855,566	567,108	111,422	109,893	74,549	86,409	108,484	2,536,635
August:	Month	19,279,131	26,283,350	17,682,927	3,442,240	3,242,600	2,231,202	2,489,021	3,571,000	78,221,471
	Daily average	621,907	847,850	570,417	111,040	104,600	71,974	80,291	115,194	2,523,273
September:	Month	19,064,500	24,111,660	18,322,800	3,341,340	3,032,970	2,027,070	2,268,630	3,465,000	75,633,970
	Daily average	635,483	803,722	610,760	111,378	101,099	67,569	75,621	111,774	2,521,133
October:	Month	19,448,892	24,247,053	19,200,098	3,509,169	3,117,298	2,058,889	2,268,885	3,400,000	77,240,285
	Daily average	627,384	782,163	619,358	113,199	100,555	66,416	72,867	109,677	2,491,622
November:	Month	18,516,467	23,083,380	18,628,290	3,313,650	2,906,760	1,956,960	2,334,730	3,302,500	73,943,737
	Daily average	617,216	769,446	620,943	110,455	96,892	65,232	74,491	110,083	2,464,758
December:	Month	18,938,823	23,208,417	19,840,009	3,427,174	2,962,750	1,927,148	2,400,578	3,219,900	74,924,799
	Daily average	610,930	716,400	640,000	110,554	95,576	62,166	77,438	103,868	2,416,930
1928—										
January:	Month	19,028,228	21,146,619	20,023,156	3,319,325	2,791,891	1,839,106	2,429,375	3,133,000	73,710,700
	Daily average	613,814	682,149	645,876	107,075	90,061	59,326	78,359	101,000	2,377,765
February:	Month	18,038,459	19,483,157	19,682,859	3,079,887	2,571,575	1,759,606	2,230,910	3,016,000	69,862,453
	Daily average	622,016	671,833	678,719	106,203	88,675	60,676	76,918	104,000	2,408,353
March	Month	19,118,320	20,162,524	21,466,632	3,379,031	2,687,948	1,871,160	2,401,911	3,255,000	74,342,526
	Daily average	616,720	650,404	692,472	109,001	86,708	60,360	77,481	105,000	2,398,146
	Total 12 months	228,933,163	275,545,629	228,033,126	40,924,722	36,958,144	23,926,541	29,431,270	39,996,700	903,698,295
	Daily average	627,461	759,191	614,060	112,636	104,163	65,960	81,049	109,501	2,474,453

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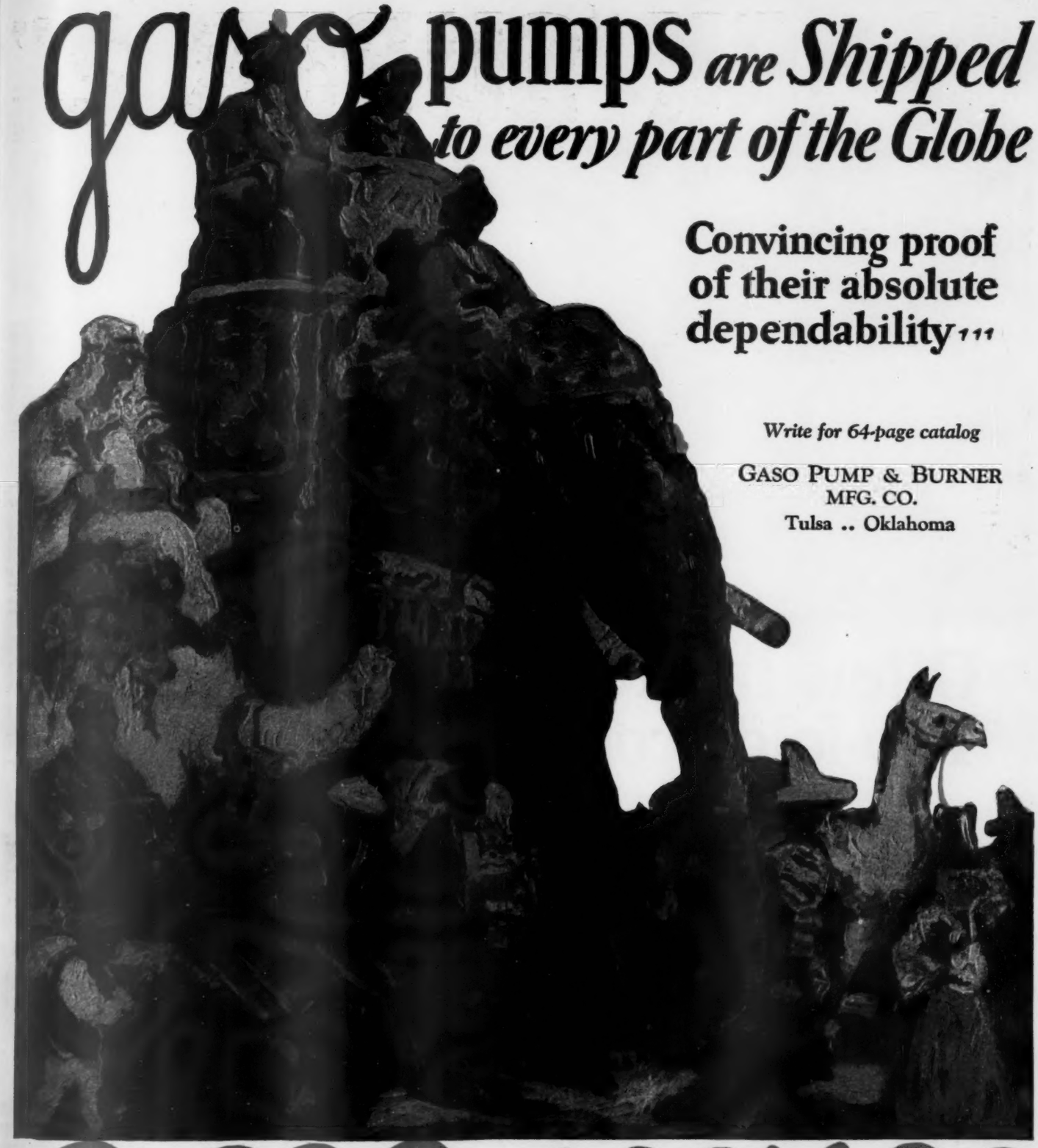

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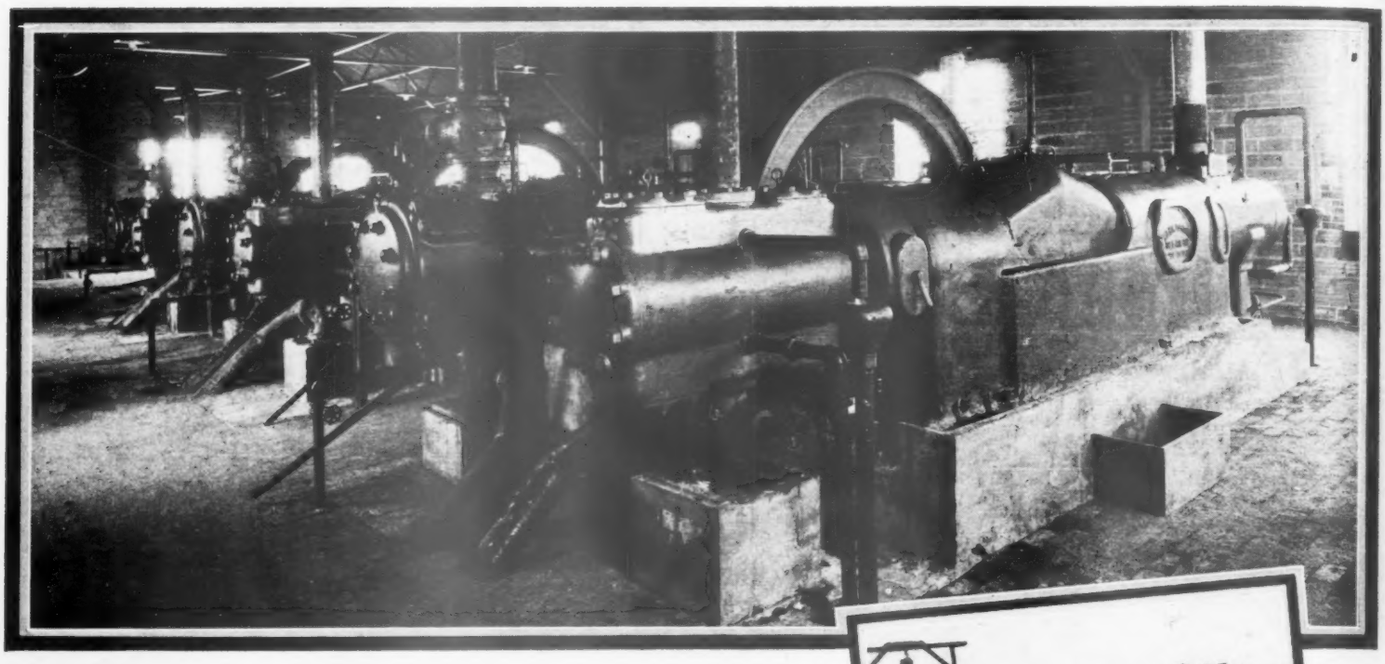

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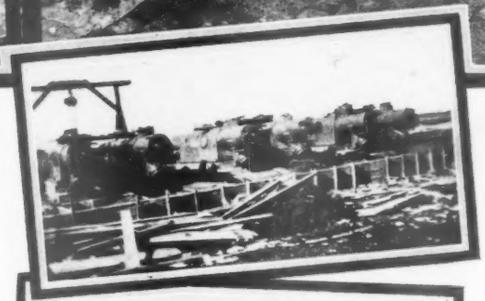

Upper illustration shows three 180 H.P. Super 2 Compressors at the Chanute, Kans., plant of the Midwest Gas Company. Center photo shows installation of the compressors and lower view the exterior of the plant.

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